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ABSTRACT

Four public libraries participated in a two-year investigation of the provision of on line reference services in a public library setting. To evaluate the utility and cost of the service, data were collected about search statistics, usage patterns, costs, and impact on the library. This volume of the report contains the evaluation methodology, extensive data tables, and a narrative summary of the evaluation results. (JY)

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Annex 1

TWO YEAR INTERIM REPORT

INVESTIGATION OF THE PUBLIC LIBRARY AS A LINKING AGENT TO MAJOR SCIENTIFIC, EDUCATIONAL, SOCIAL, AND ENVIRONMENTAL DATA BASES

ANNEX I: EVALUATION RESULTS

Alice E. Ahlgren
October 1976

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TWO YEAR INTERIM REPORT

INVESTIGATION OF THE PUBLIC LIBRARY AS A LINKING AGENT TO MAJOR SCIENTIFIC, EDUCATIONAL, SOCIAL, AND ENVIRONMENTAL DATA BASES

Annex 1: Project Evaluation

LMSC-D502595 1 September 1976

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FOREWORD

This report is Annex I of the Two Year Interim Report of Project DIALIB. Under the sponsorship of the National Science Foundation (User Support Program, Division of Science and Information Service), Lockheed Information Systems is conducting Project DIALIB to determine whether on-line retrieval services are useful to the general public, and if the public library can be used as a "linking agent" to provide these services. As part of the study, the Lockheed on-line reference retrieval service (DIALOG) was made available to the public through four public libraries in San Mateo and Santa Clara Counties in Northern California. Evaluation of this experiment was performed by Applied Communication Research, a non-profit, behavioral research firm located in Palo Alto, California. The project was reviewed by an Oversight Committee of five experts from the fields of public librarianship, marketing, and information science.

Annex I is a descriptive analysis of the first two years of Project DIALIB. A summative evaluation and policy recommendations will be given in the final report to be completed in October 1977. For a description of Project DIALIB and its organization, the reader should consult the main volume. For a description of publicity aspects of the project, the reader should consult Annex II.

A limited number of copies of the Two Year Interim Report and the two annexes (evaluation and publicity) are available from Lockheed Information Systems. Copies are also available through NTIS and ERIC.

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I. INTRODUCTION

In 1974, Lockheed Information Systems received a grant from the National Science Foundation* to conduct a study to determine whether on-line retrieval services are useful to the general public and if the public library can be used as a "linking agent" to provide these services. The grant summary was as follows:

"The purpose of this project is to conduct an operational experiment to test the feasibility, economic viability, and utility to users of using the existing public library system to provide public access to computerized (online) scientific and technical information services (query, search, and retrieval) heretofore unavailable and inaccessible to either the general public or the scientist/engineer in smaller organizations; and to determine the impact of such services on both libraries and service users. The project entails a two-year program to be carried out in several libraries of the Cooperative Information Network of San Mateo and Santa Clara Counties in California. The online retrieval capability, which will be provided by the Lockheed DIALOG system, offers access to a wide range of . . . data bases. Statistical data are to be collected and analyzed with respect to (1) utility and utilization of public libraries as technical information dissemination centers, and (2) marketing variables and marketing methods for motivating new users of services providing online access to scientific and technical information."

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* Grant GN SIS74-13972, Division of Science and Information Service, National Science Foundation.

The four libraries chosen to participate in the study included the Redwood City Public Library, the San Jose Public Library, the San Mateo County Library, and the Santa Clara County Library. All four libraries are members of the Cooperative Information Network (CIN), a Northern California cooperative of school, public and corporate libraries that shares information resources. Terminals were installed in July 1974 in each of the four libraries selected. Terminals and staff training were provided at no cost to the participating libraries throughout the two year project.

During the first year of the project (referred to as the "free period"), the four libraries offered on-line searches to patrons at no cost. During the second year of the project (referred to as the "pay period"), libraries were responsible for one-half of the actual cost of the on-line search. (All Project DIALIB libraries charged patrons one-half the cost of on-line search time plus off-line citations printed during the pay period.) The National Science Foundation paid the balance. During the pay period, additional libraries in other parts of the United States were added for a six-month period. Profiles of these non-CIN libraries are given in Appendix D.

Project DIALIB has been extended for a third year, which is now in progress. During this third year, public libraries are passing on to the patron the full cost of on-line search time plus the cost of off-line citations. An evaluation of this crucial period is not included in the present report but will be reported on in October 1977.

Evaluation of this project is being conducted by Applied Communication Research (ACR). ACR is a non-profit, behavioral research company and was selected by Lockheed Information Systems to perform an independent project evaluation.

The following report is a descriptive analysis of the first two years of Project DIALIB. Chapter II (EVALUATION FRAMEWORK) describes the objectives of the study and some caveats which should be kept in mind before generalizing from study results. Chapter III (DATA COLLECTION) describes data collection procedures and instruments.

Chapter IV (PROJECT DIALIB CASE STUDY) provides detailed information on search statistics, usage patterns, and user characteristics separately for both the free and pay periods. Differences in variables between periods are then identified and discussed. The final section of Chapter IV describes the impact of the on-line service on the reference staff, on library policy, and on the communities served by the public libraries participating in Project DIALIB.

Chapter V (INTERLIBRARY COMPARISONS) looks at differences in on-line service operation and use among the four Project DIALIB libraries. First, differences are identified and discussed for the free period and the pay period separately. In order to determine some of the factors which contributed to these differences, DIALOG librarians at all libraries were interviewed to ascertain both how DIALOG searches were handled at each library and librarian reactions to the service. Library profiles, based on these interviews, are presented for each of the four Project DIALIB libraries. The final sections of Chapter V attempt to explain some of the differences that appeared among libraries for both the free and pay periods. Suggested reasons for differences are based on the library profiles.

Chapter VI (CONCLUSIONS) contains general conclusions suggested by the evaluation data and a number of pertinent observations derived from the entire Project DIALIB experience.

II. EVALUATION FRAMEWORK

One of the principal purposes of the evaluation conducted by Applied Communication Research was to provide public library administrators with data which would allow them to make decisions about the utility of providing an on-line search service through the public library and to determine what the cost of such a service would be.

It is important to remember that the evaluation data presented in the following sections are from an experimental project supported in large part by federal funds. Whether or not these results are generalizable to other libraries which do not have the advantage of an external funding source remains to be seen. In addition, the experimental nature of the project provided a number of "fringe benefits" for the participating libararies which might not be easily available to other public libraries interested in implementing an on-line service. One major "fringe benefit" was a publicity campaign for the on-line service which was paid for through the NSF grant rather than by the libraries. Another "fringe benefit" was the specialized attention of Lockheed project staff to Project DIALIB library problems; such as equipment malfunctions, on-line search strategy, staff training, etc. Lockheed project personnel devoted considerable time to trouble-shooting, handling complaints and problems from the four Project DIALIB libraries, and interacting with library personnel on topics ranging from system operation and pricing policies to rationales for fee-based reference services. These fringe benefits make it difficult to generalize from project evaluation results to libraries which may not have such advantages.

Another major note of caution concerns the funding problem, as mentioned previously. One of the primary purposes of the project was to test the economic viability of using public libraries to provide access to on-line scientific and technical information services. The evaluation data presented here cannot be used to answer the viability question, since the data cover those periods when the on-line service was either partially or fully supported by external funds. There have been many experimental systems which have functioned well under outside support but have been forced to terminate when that outside support has been removed. Public libraries, which depend on local public funds for support, are particularly vulnerable to this problem.

If this study is to provide meaningful information to library administrators, it is imperative that data describing library operation under self-support be obtained before the results are generalized and used to develop policy recommendations. Premature generalizing and development of policy recommendations will seriously undermine the value of data collected to date and could adversely affect the validity. In addition, such generalizations could cause readers to draw conclusions which cannot be supported by the existing data.

For these reasons, we have restricted the following report to a descriptive analysis (formative evaluation) of the first two years of Project DIALIB. The final chapter -- completion of the summative evaluation and development of policy recommendations -- must wait until data from the third (self-support) phase of the project are available and have been analyzed.

EVALUATION DIMENSIONS

Project DIALIB libraries were examined along three major dimensions -- actual search statistics, usage patterns and user characteristics, and library impact. It was not possible to provide data on these dimensions for the four non-CIN libraries which were added during the last six months of the project. Low search activity on the part of these libraries resulted in too little available data to make generalizations possible. However, profiles of each library providing on-line services were compiled (see Appendix D for profiles of non-CIN libraries). For Project DIALIB libraries, these profiles were used to provide comparisons between each of the libraries and to explain some of the observed differences between libraries.

One of the major difficulties of the study was the development of an evaluation methodology that would provide information on the wide variety of factors that affect the operation of an on-line service. Search statistics alone were not considered an adequate method of evaluating an on-line operation. To provide a broad overview of on-line service operation that would actually be of assistance to administrators involved in planning, data were also needed from library patrons, reference librarians conducting on-line searches, head reference librarians, and library administrators. Data collection instruments and methods are described in Chapter III.

OBJECTIVES

Specifically, the objectives of the evaluation were as follows:

1. To determine how useful an on-line retrieval service is in meeting the needs of the general public.
2. To develop a user profile that will assist library administrators in identifying the principal users of the system, the ability of patrons to pay for system use, and the types of information patrons require.
3. To examine the effect of the on-line service on the library reference service and to isolate causes for acceptance or rejection of the service.
4. To determine the actual costs of providing such a service and to outline the factors contributing to these costs.
5. To identify specific characteristics of different libraries which would have an effect on the operation.

To accomplish these objectives, the evaluation examined public library operation of the on-line system within the framework of a diffusion of innovation model. It was expected that the adoption of an on-line retrieval system by a public library would conform closely to the model described by Paisley (1973) in her discussion of educational innovations. Essentially, the Paisley model describes those factors which influence the adoption of an innovation by a group (as opposed to an individual). These factors include "the demands it makes on staff capabilities, the demands on money resources, the demands on the school structure, and the demands on the administration of education. If these demands are particularly heavy, then adoption is unlikely. If they are light, then adoption is much more likely."

This study examines library reactions to an on-line system primarily in terms of the factors included in this model.

III. DATA COLLECTION

The data included in the case studies that follow were collected during the period from September, 1974, through May, 1976. DIALOG searches were offered to patrons of the Project DIALIB libraries at no cost from September, 1974, through May, 1975 (referred to as the "free period"). From June, 1975, through May, 1976, DIALOG searches were provided at half cost to patrons (referred to as the "pay period").

Data were collected through four major sources: computer command summary sheets, search request forms completed both by the patron at the time of the search request and by the librarian upon completion of the search, follow-up questionnaires completed by patrons after receipt of the results of their searches, and interviews with working librarians, head reference librarians and library administrators.

DATA COLLECTION FORMS

All data collection forms were used during both the free and pay periods. Also, with the minor exceptions noted below in the Search Request Forms, all forms used were identical for both periods. Each of these data sources is described below:

1. Computer Command Summary Sheets - These summary sheets are available for all DIALOG searches from Lockheed in Palo Alto. Summary sheets for all searches completed from September, 1974 through May, 1976, were obtained

and analyzed. (See Form 1 in Appendix A for a sample of a computer command summary sheet.)

2. Search Request Forms - These forms were initially designed in August, 1974, but were not distributed to all libraries until October, 1974. This delay was due to negotiations required to persuade all libraries to accept one common form and to persuade library heads that patron confidentiality would be maintained. Two weeks after the forms were put into operation, all librarians were contacted to determine if there were any suggestions for changes to be made in the form. A revised form was then distributed to all libraries in November, 1974 (see Form 2 in Appendix A). In response to special requests from the San Mateo County Library, a longer version of the Search Request Form was designed for use by San Mateo County. During the pay period, this long Search Request Form (revised to include one additional question on the cost of the search to the patron) was used by all libraries (see Form 3 in Appendix A).

These forms were filled out by both the client at the time of the search request and by the librarian upon completion of the search. All clients requesting a DIALOG search completed this form. Clients did, however, have the option of refusing to allow the librarian to release their names to the evaluator.

3. Follow-up Questionnaires - Upon receipt of a copy of the Search Request Form, the evaluator mailed the client a Follow-up Questionnaire (see Form 4 in Appendix A). Business reply envelopes were included so that the patron could return the questionnaire directly to the evaluator. All clients who had a search done received a copy of the Follow-up Questionnaire unless they had either refused release of their names or they had specifically stated that they did not wish to participate in a follow-up study. Patrons who had more than one search done received a shorter version of the Follow-up Questionnaire for each additional search requested (see Form 5 in Appendix A).

4. Librarian Interviews - All working librarians, head reference librarians, and library administrators were interviewed to determine their reactions to DIALOG, their satisfaction (or dissatisfaction) with the system, and the effect of the system on the library as a whole and on the reference service in particular. Working librarians were interviewed in person, except in instances where the librarian was no longer working for the library or was on vacation. In these latter cases, librarians were given copies of the interview schedule which they were asked to complete and return by mail. All interviews were held at the participating libraries. Although an interview schedule was followed by the interviewer (see Form 6 in Appendix A), all interviews were kept fairly open-ended and low key to encourage librarian comments.

Head reference librarians were also interviewed at the libraries. Again, an interview schedule was used (see Form 7 in Appendix A), but open-ended comments were encouraged.

Library administrators were also interviewed at the libraries. No formal questionnaire was used and administrators were encouraged to comment on all aspects of the DIALOG service, its effect on their library and reference staff, and their personal reactions towards the usefulness of the system to the public library and the public library patron.

SAMPLE SIZE

In all cases, with the one exception of the Follow-up Questionnaire, a 100% sample of DIALOG patrons was used. The need for this 100% sample was due primarily to the lack of any prior knowlege about who the users of the system would be. It was impossible to sample from an unknown population. Also, it was not possible to anticipate the actual number of users of the system prior to the experiment as no comparable operation existed previously. In addition, it became apparent early in the experiment that there were noticeable differences in the number of DIALOG searches performed, the time required to do these searches, patron characteristics, and librarian attitudes at the four libraries participating in Project DIALIB. Thus, a 100% sample would insure that a large enough population of users was available from each library to make possible adequate comparisons between libraries.

COMPLETION RATE

As of May 31, 1976, the following number of forms were processed:

Form	Free Period	Pay Period
Computer Command Summary Sheets	1920	1342
Search Request Forms*	1236	611
Follow-up Questionnaires	443	161
Librarian Interviews	16	15

*Note: Patrons who refused release of their names or who specifically stated that they did not wish to participate in a follow-up study, did not receive Follow-Up Questionnaires.

IV. PROJECT DIALIB CASE STUDY

The case study discussed below actually presents two different approaches to the provision of on-line search services. The study looks at the effect of offering on-line services through four public libraries, first, at no cost to the patron (referred to as the "free period") and, second, at half-cost to the patron (referred to as the "pay period"). Search statistics, usage patterns and user characteristics are presented separately for each period. The section on library impact, however, takes both time periods into consideration. The case studies of each time period are followed by a discussion of changes which occurred within each evaluation dimension between time periods.

In addition to this major dichotomy, the study compares differences in on-line system operation between each of the four Project DIALIB libraries for both time periods. Possible reasons for these differences are also discussed. Such interlibrary comparisons are useful because each of the four participating libraries represents a somewhat different type of library service (see Chapter V). The San Jose City Library serves a fairly large metropolitan area. The Santa Clara County Library is located in a suburban area and is part of a large system with branches all over the county. The San Mateo County Library also deals with a large number of branch libraries located throughout the county, is geographically isolated and has almost no "walk-in" patrons. The Redwood City Public Library is a smaller city library with two small branches and primarily "walk-in" business.

SEARCH STATISTICS - FREE PERIOD

One of the most important factors which library administrators must take into consideration when introducing any new service is cost. Public libraries operate with limited budgets. In order to determine the cost of providing on-line search services, library administrators need to know the following search-related statistics: telephone connect time, data base access rates, total number of citations printed, and staff time.

On-Line Search Statistics

Telephone costs vary depending on the procedure used. Project DIALIB libraries used direct distance dialing. However, users may also direct dial through WATS, FTS, from a Tymshare access point (at $10 per hour), or from Telenet (at $8 per hour). The cost of accessing data bases ranges from $25 per hour to $150 per hour, depending on which data base is used. Table 1 lists data bases, in order of frequency of use by the four libraries participating in Project DIALIB, and data base access rates.

TABLE 1

FREQUENCY OF USE OF DIALOG DATA BASES AND ACCESS RATES
(Free Period: September 1, 1974 through May 31, 1975)

DATA BASE	NUMBER OF SEARCHES	PER CENT OF TOTAL	ACCESS RATE
NTIS	471	39.8	$35/hr.
Psychological Abstracts	357	30.2	$50/hr.
ERIC	344	29.1	$25/hr.
Social Science Citations	239	20.2	$70/hr.
Engineering Index (COMPENDEX)	206	17.4	$65/hr.
INSPEC	148	12.5	$45/hr.
Chemical Abstracts	145	12.2	$45/hr.
ABI	108	9.1	$65/hr.
NAL/CAIN	101	8.5	$25/hr.
PANDEX	40	3.4	(no longer available)
CMA	27	2.3	$90/hr.
F & S	18	1.5	$90/hr.
AIM	12	1.0	$25/hr.
Exceptional Children Abstracts	4	.3	$25/hr.
CLAIMS	2	.2	$65/hr.

(The percentages in Table 1 do not add up to 100 because one search often uses more than one data base. In fact, the average number of data bases used per search was two.)

Table 2 presents total number of searches completed by the four libraries (see Figure 1 for trend line), the average search time for one question, and the average number of on-line, off-line and total citations printed per search.

TABLE 2

MEAN SEARCH TIME AND CITATIONS - TOTAL FOR ALL LIBRARIES
(Free Period: September 1, 1974 through May 31, 1975)

	1974				1975					
	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	TOTAL
Number of Searches	55	156	160	171	217	240	249	385	287	1920
Average Search Time (in minutes)	31.28	28.78	30.17	25.06	22.03	20.00	18.79	18.88	18.69	22.02
Online Citations Per Search	19.20	15.34	16.11	15.46	11.14	17.59	15.92	12.23	11.72	14.27
Offline Citations Per Search	11.67	90.53	35.59	25.75	44.53	53.79	46.07	55.21	94.88	55.83

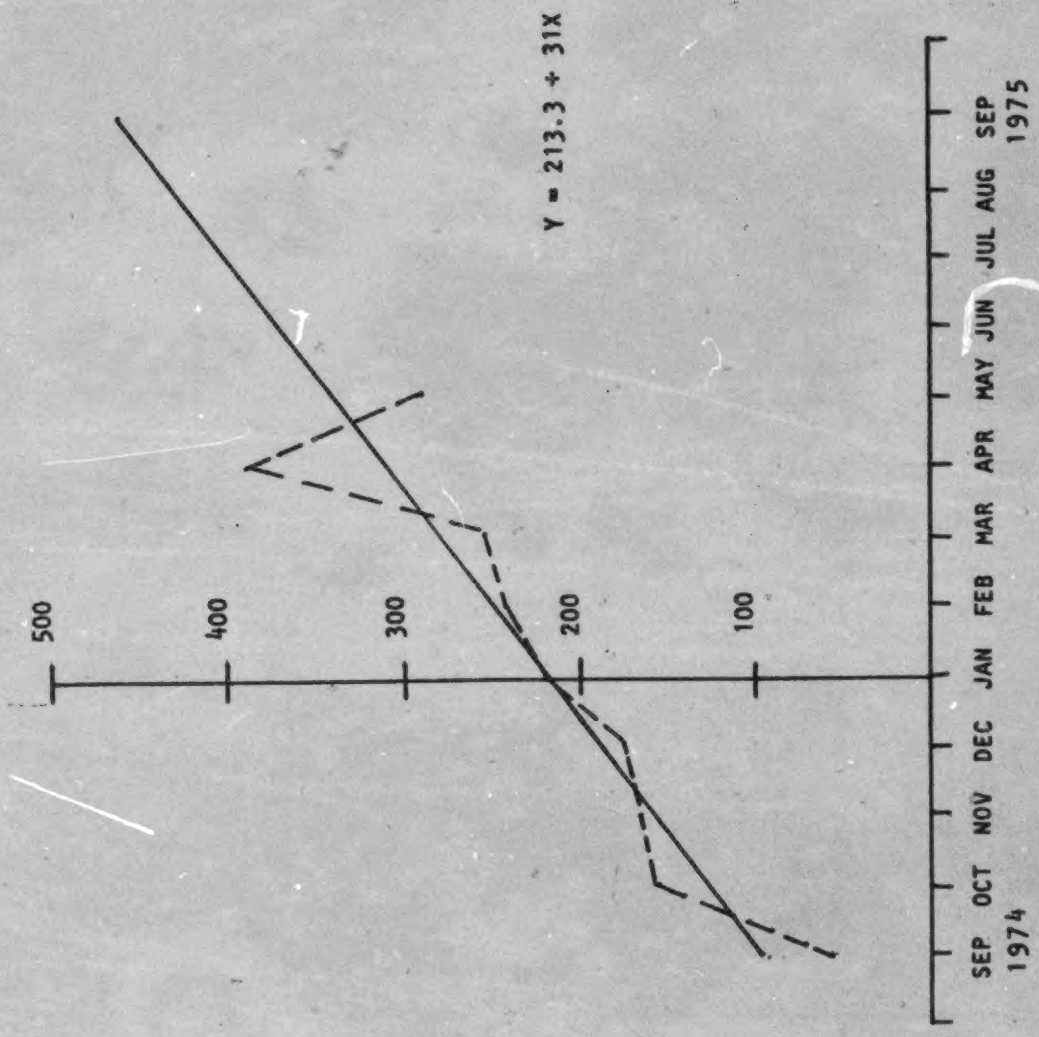

FIGURE 1. TREND LINE FOR TOTAL NUMBER OF DIALOG SEARCHES - FREE PERIOD

The results presented in Table 2 indicate that the average search time dropped from a high of 31 minutes per search during September, 1974, to about 19 minutes per search by May, 1975 (see Appendix C, "Changes in Online Search Times"). The total number of citations being printed varied widely during the first year of the experiment, averaging about 56 for off-line citations printed (with a standard deviation of 212.40) and 70 for total citations printed (with a standard deviation of 212.48).

Considering that the average cost of accessing a data base is about $40-50 per hour and that the average search during the free period required 22 minutes, this represents an approximate cost of $14.80 - $18.50 per search for connect time alone.

The cost of citations printed must be added to the cost for connect time. The average number of off-line citations printed out per search is 56. The cost of printing off-line citations is 4 cents for titles and 10 cents for titles plus abstracts. Thus, the average search costs an additional $2.24 - 5.60 depending on the number and format of citations requested. The average search may vary therefore from $14.80 - 24.10, not including staff time or fixed expenses.

Staff Time*

In addition to these costs, provision of an on-line service by the public library involves a number of less obvious costs. These costs include the reference staff time required for training, for off-line search preparation, for on-line searching, and for location of source documents.

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* No data was collected for Project DIALIB libraries on staff time required for in-depth manual searching on reference requests. It is not possible, therefore, to determine if the staff time required for on-line searching differs substantially from staff time required for manual reference searching. Such data will be collected during the third year of Project DIALIB.

In the introduction of any new service, there is an initial period required for training. Training costs include both the actual cost of the training and the cost of removing the librarian from service for the length of time required to attend a training session. Unless the library faces a rapid turnover of personnel, this expense can be considered minimal.

Besides training expenses, DIALOG searches may also require both off-line preparation time and time to locate source documents. Table 3 provides off-line preparation time broken down by library. (Note: In all Tables, the percentage of non-respondents is not included.)

TABLE 3

AVERAGE OFF-LINE SEARCH PREPARATION TIME* BY LIBRARY
(Free Period)

MINUTES	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
0	37.3%	35.0%	19.3%	65.4%	45.7%
5-10	44.9	19.2	29.3	21.0	26.8
15-25	13.5	17.6	37.4	11.8	17.3
30-35	4.0	12.5	10.6	1.0	5.6
40-45	.4	4.5	1.0	.2	1.3
50-65	-	8.4	1.5	.2	2.1
70-90	-	3.4	2.0	.4	1.2
	N = 252	266	198	520	1236

* Off-line times were consistently reported in blocks of five minutes. Table 3, therefore, reports time estimates in discrete intervals.

Off-line preparation time varies widely between libraries. Redwood City indicates that 65% of their searches require no off-line preparation time, whereas San Mateo requires between 15 and 35 minutes of off-line preparation time for 48% of their searches. This time is in addition to the average 22 minutes which the librarian spends at the terminal. A study conducted for Applied Communication Research by Cooper and DeWath (1975) of the time required for a DIALOG search by Project DIALIB librarians indicates that the average amount of personnel time spent off-line during the free period amounts to $2.78 per search in direct labor costs [see Appendix E].

Finally, the data indicate that, while most patrons are members (i.e., have library cards) of one of the libraries in the CIN network, the majority are not members of one of the four libraries conducting the searches. In fact, only 36% of DIALOG patrons are members of one of the four participating libraries, while 54% are members of libraries not participating in the project, and 8.6% of the patrons are not members of any library. Provision of DIALOG service does place an added burden on the staff at Project DIALIB libraries by bringing in individuals who would probably normally patronize those libraries for which they hold cards.

Search Results and Source Documents

Once the librarian completes the search, the search results can either be mailed to the patron or picked-up by the patron directly from the librarian. Table 4 indicates the number of days it takes the patron to receive the results of a DIALOG search from the time the search request is submitted.

TABLE 4

TIME FOR PATRON TO RECEIVE CITATIONS BY LIBRARY
(Free Period)

DAYS	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
1	-	26.6%	-	5.2%	8.0%
2-7	32.1	51.9	22.1	66.1	42.3
8-14	45.3	16.6	45.5	22.5	12.9
15-21	13.8	2.5	17.7	1.9	1.4
22-42	5.7	-	10.3	3.2	.3
	N = 80	107	73	183	443

The libraries estimate that it takes two days to receive off-line citations from Lockheed. Patrons who received their search results on the same day they submitted their request were generally present at the time of the search and received only citations printed on-line. It is clear from Table 4 that there are noticeable differences between libraries in terms of the period which elapses from the time the patron requests a DIALOG search to the time the patron receives the search results. Two of the libraries provided over 70% of their patrons with search results in less than one week. At the other two libraries, almost 50% of the patrons waited from one to two weeks to receive search results. These differences will be discussed in Chapter V.

As in manual reference searching, DIALOG provides only citations and abstracts. Additional time is then required to locate pertinent documents cited in the search results. Early data indicate that the library conducting the search is not the supplier of the majority of documents. Instead, patrons have turned to a number of other sources to provide the required documents. These sources are listed in Table 5.

TABLE 5

SOURCES THROUGH WHICH DOCUMENTS ARE OBTAINED
(Free Period)

SOURCE	PER CENT OF TOTAL
Library at Which DIALOG Search is Made	29.9%
College Library	21.9
Stanford University	11.1
Branch Library	8.9
Bookstore	4.7
Company Library	4.2
San Mateo County Office of Education	3.0
NTIS	3.0
Publisher	1.1
State Mental Health Department	.8
Government Printing Office	.8
State Department of Education	.6
Agency Library	.6
USGS	.6
San Mateo County Health and Welfare Department	.6
San Mateo County Law Library	.3
Authors Directly	.3
Patent Office	.3
State Game Department	.3
	N = 443

These results indicate that the library conducting the search is not the supplier of the majority of documents. In fact, only 30% of on-line search service patrons obtain documents through the library at which the search was done. Instead, a wide variety of other sources are used including, principally, academic libraries to which 33% of the patrons go to obtain documents. Publishers, NTIS, company libraries, various State of California department libraries, and diverse additional sources also provide patrons with documents.

Also, 50% of DIALOG patrons stated that the results of their DIALOG search indicated additional questions of interest to them. Of these patrons, about 36% indicated that they either already had or intended to follow-up and obtain information on these new topics. Of these individuals, 14% returned either to a main or a branch library for information and about 10% had an additional DIALOG search done.

USAGE PATTERNS - FREE PERIOD

It is also useful for library administrators to know who the principal users of the system are, the reasons these users require on-line searches, the frequency with which the service would be used, and user satisfaction with the results of the search.

User Characteristics

Table 6 provides a breakdown of on-line search service users by occupation.

TABLE 6

OCCUPATION OF DIALOG CLIENTS BY LIBRARY
(Free Period)

OCCUPATION	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Technical Professional	7.9%	22.2%	7.6%	16.9%	14.7%
Graduate Student	15.1	14.3	17.7	11.0	13.6
College Undergraduate Student	15.5	9.4	5.6	16.2	12.9
Education	13.1	15.8	9.6	13.3	13.2
Librarian	7.9	5.3	9.6	5.2	6.5
Professional (e.g., M.D., Lawyer, Psychologist)	.4	1.1	15.7	5.8	5.4
Scientist or Research	4.0	5.6	8.1	4.0	5.0
Business Professional	3.2	4.5	6.1	3.1	3.9
Skilled Labor	.8	1.9	.5	1.9	1.5
Small Business Owner	.4	1.1	0.0	2.7	1.5
Social Worker	.4	.8	3.5	1.2	1.3
Counselor	.4	1.5	1.0	.4	.7
Other	6.0	4.6	11.1	10.8	8.1
N =	252	266	198	520	1236

The two principal classes of users, as indicated by this data, are technical professionals (including civil, nuclear, and electronic engineers, geologists, and computer specialists) and students. The next two major sets of users are individuals in the education field (including teachers, professors and school administrators) and librarians. Over 80% of these patrons indicate that they have not used an on-line search service in the past.

The data in Table 7 show that the majority of searches are done either as part of the patron's job or for a research paper.

TABLE 7

REASON FOR DIALOG SEARCH BY LIBRARY
(Free Period)

REASON FOR SEARCH	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Job	24.2%	41.7%	42.9%	30.0%	33.4%
Research Paper	34.5	31.2	24.2	35.6	32.6
Personal Interest	5.6	8.6	9.1	8.3	7.9
School Assignment	6.7	3.0	5.6	4.8	4.9
Advanced Degree Work	2.4	4.9	6.1	1.3	3.1
Business Related	1.2	1.9	3.5	2.7	2.3
Research & Development	1.2	1.5	1.5	2.3	1.8
Book	.4	.8	1.5	2.1	1.4
Teaching	.4	.8	-	.4	.4
	N = 252	266	198	520	1236

Table 8 indicates the average level of education of the DIALOG patron. About 40% have advanced degrees and another 28% have some graduate work.

TABLE 8

LEVEL OF EDUCATION OF DIALOG CLIENT
(Free Period)

LEVEL OF EDUCATION	PER CENT OF TOTAL
Ph.D. or M.D.	13.8%
Masters Degree	26.2
Graduate Student	28.2
College Graduate	15.1
College Student	11.5
High School Graduate	.7
High School Student	1.1

N = 443

Also, over 60% of DIALOG users are male and over 60% are between the ages of 20 and 40.

These initial findings suggest that on-line search service clients are not the traditional heavy users of the public library. A study by Paisley and Rees (1967) indicates that college graduates are not as regular in public library use as either high school graduates or individuals with only some college. Paisley and Rees also discovered that more women use reference books than men and that use of reference books declines with age. On-line search service users do not fit these characteristics.

As indicated in Table 9, approximately 40% of DIALOG patrons use the public library very infrequently (i.e., monthly, several times a year, or not at all).

TABLE 9

ESTIMATED FREQUENCY OF LIBRARY USE BY DIALOG PATRONS
(Free Period)

FREQUENCY	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Daily	5.5%	5.6%	5.5%	4.9%	5.4%
Weekly	13.7	33.6	23.3	31.7	27.3
Several Times a Month	30.1	28.0	23.3	22.4	25.3
Monthly	24.7	8.4	17.8	20.2	17.6
Several Times a Year	20.5	17.8	23.3	15.3	18.3
Not At All	1.4	2.8	4.1	2.2	2.5
N =	80	107	73	183	443

Furthermore, 57% of DIALOG patrons normally use the reference service only several times a year or not at all.

TABLE 10

ESTIMATED FREQUENCY OF REFERENCE SERVICE USE
(Free Period)

FREQUENCY	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Daily/Weekly	6.8%	7.5%	5.5%	7.1%	7.0%
Several Times a Month	11.0	18.7	17.8	15.3	15.6
Monthly	15.1	13.1	11.0	16.9	14.9
Several Times a Year	42.5	44.9	45.2	39.3	42.2
Not At All	16.4	8.4	15.1	18.0	14.7
N =	80	73	107	183	443

Table 11 indicates estimated frequency of future use of an on-line search service by patrons who have already used DIALOG.

TABLE 11

ESTIMATED FREQUENCY OF FUTURE DIALOG USE
(Free Period)

FREQUENCY	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Daily/Weekly	2.7%	3.7%	-	1.6%	2.0%
Several Times a Month	6.8	9.3	1.4	10.9	8.1
Monthly	19.2	14.0	16.4	13.7	15.6
Several Times a Year	65.8	68.2	68.5	67.2	67.3
Not At All	1.4	.9	8.2	2.2	2.7
N =	80	107	73	183	443

Search Questions

The types of questions being asked by this well-educated set of users are also not the types of questions normally asked of a reference librarian in a public library. In a study by Palmour and Gray (1972) examining the cost of answering reference questions in Illinois libraries, reference questions were placed in one of four distinct categories. These categories included bibliographic citations, simple fact, multiple fact, and complex fact questions. "Simple fact" questions, which represented 66% of all reference questions, were those defined as "requiring a single answer that may be found in one reference tool." "'Multiple fact' questions involved answers compiled from one or more sources where the various parts of the answer are brought together for the user . . . 'Complex fact' questions utilize various sources from which conflicting facts and opinions are compiled, compared, and contrasted." Most on-line search questions submitted during the no-charge period requested all information available on a particular topic. Therefore, these questions do not fit easily into any of the above categories. In fact, although patrons are currently asking questions on a wide variety of subjects, the majority of questions being answered by DIALOG are highly technical. A two-week tabulation of search titles, given in Figure 2, indicates the diversity and complexity of questions submitted by patrons.

An examination of search questions (using the Computer Command Summary Sheets) indicates that these questions are not the type of "simple fact" questions normally answered by a reference librarian in a public library. Yet, the DIALIB experiment indicates that public reference librarians can provide answers to these types of complex and technical questions and that these answers are extremely useful to the patrons.

FIGURE 2. SEARCH TITLE GROUPED BY GENERAL CATEGORY - FREE PERIOD

PSYCHOLOGY

Child Abuse
Child Psychology
Successional Development
Meditation
Art Therapy
Behavioral Approaches to Counseling
Mental Health
Behavior Therapy/Marriage
Sleep

EDUCATION

Accreditation
Learning Disabilities
Videotapes
Continuous Progress Math Program
Successful Development
Bilingual Education
Parent Participators
Science Instruction
Overseas Bible Schools

BIOLOGY/MEDICINE

Abiogenesis
Cellulose from Protein
Protein Gel
Cocaine
Antibiotics
RH Incompatibility
Fish; Visual Perception
Adaptation

LAW

Parliamentary Law
Crime and Theories of Gun Control

AGRICULTURE

Cattle Feeding - Algae
Rabbit Breeding
Growing Bananas
Wind Industry

ENGINEERING/SCIENCE

Computerized Data Banks
Computer Output Microfilm
Boat Building Industry
Plastics Processing
Minicomputer Applications
Hydrogen Production
Concrete Water Tanks
Ion Beam Processing
Auger Spectroscopy
Read-only Storage
Natural Gas
Resin Bolts
Hydraulics
Microspheres
Parabolic Antenna
Electric Substation
Bicycles and Motorcycles
Automobile Maintenance
Ports
Mining
Associative Memories - Computers
Thin Film Magnetic Tapes

SOCIAL SERVICES

Speaker Credibility
Zero Population and Pensions
Noise Pollution
Recycling Books
Recycling Paper
Technology Transfer
Quality of Life
Social Responsiblity

OTHER

Theater Stage Construction
Comfrey
Xanathan
Paleotology

Search Value

Table 12 indicates patron responses to a question dealing with the value of an on-line search to the patron.

TABLE 12

VALUE OF SEARCH TO PATRON
(Free Period)

VALUE OF SEARCH	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Major Value	21.9%	21.5%	13.7%	26.2%	22.1%
Considerable Value	47.9	47.7	50.7	43.5	46.5
Minor Value	21.9	21.5	21.9	25.1	23.3
No Value	5.5	7.5	12.3	4.4	6.8
	N = 80	107	73	183	443

The data presented indicate that almost 70% of DIALOG patrons felt that the results of their search were of considerable or major value to them. Also, as indicated in Table 13, 53% indicated that the results of their search provided sufficient references to answer their question adequately.

TABLE 13

SUFFICIENT REFERENCES PROVIDED TO ANSWER QUESTION ADEQUATELY*
(Free Period)

QUESTION ANSWERED ADEQUATELY?	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Yes	53.4%	53.3%	46.6%	56.3%	53.0%
No	38.4	43.0	49.3	39.9	42.4
N =	80	107	73	183	443

*Insufficient references may be provided due to lack of information available in the data bases, lack of searcher expertise, inadequate explanation by patron of information needs, etc.

Table 14 indicates the number of citations that were actually of use to the DIALOG patron.

TABLE 14

NUMBER OF CITATIONS OF USE TO PATRON
(Free Period)

NUMBER OF CITATIONS	PER CENT OF TOTAL RESPONSES
0	17.8%
1 - 5	30.0
6 - 10	15.3
11 - 15	9.4
16 - 20	5.3
21 - 50	9.7
More than 50	3.6
	N = 443

Publicity

Table 15 indicates the percentage of users who heard about the availability of the on-line service through each of a number of different sources.

TABLE 15

SOURCE THROUGH WHICH PATRON HEARD ABOUT ON-LINE SEARCH SERVICE AVAILABILITY
(Free Period)

SOURCE	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Public Librarian	15.5%	29.7%	26.8%	22.1%	23.1%
Friend	21.0	27.8	16.7	19.2	21.0
Notice in Public Library	6.7	12.8	18.7	15.4	13.6
Newspaper	7.9	10.9	11.6	11.5	10.7
Mailed Notice	6.3	3.4	7.1	4.0	4.9
College Librarian	8.7	4.9	2.0	3.1	4.4
Teacher	4.4	1.1	2.0	2.5	2.5
Small Business Seminar	-	1.1	1.0	1.9	1.2
CIN Mailing	1.2	1.5	3.0	-	1.1
	N = 252	266	198	520	1236

Librarians and friends were the major sources through which users were informed about the availability of the service. These sources were followed in rank by notices in the libraries and newspaper publicity.

SEARCH STATISTICS - PAY PERIOD

Table 16 lists data bases in order of frequency of use during the pay period and data base access rates.

TABLE 16

FREQUENCY OF USE OF DIALOG DATA BASES AND ACCESS RATES
(Pay Period: June 1, 1975 through May 31, 1976)

DATA BASE	NUMBER OF SEARCHES	PER CENT OF TOTAL	ACCESS RATE
ERIC	232	38.0	$25/hr.
Psychological Abstracts	180	29.5	$50/hr.
NTIS	108	17.7	$35/hr.
Engineering Index (COMPENDEX)	101	16.5	$65/hr.
Social Science Citations	58	9.5	$70/hr.
Chemical Abstracts	55	9.0	$45/hr.
INSPEC	41	6.7	$45/hr.
AIM/ARM	34	5.6	$25/hr.
ABI	33	5.4	$65/hr.
NAL/CAIN	26	4.3	$25/hr.
BIOSIS	24	3.9	$65/hr.
SCISEARCH	9	1.5	$70/hr.
F & S	9	1.5	$90/hr.
CMA/EMA	9	1.5	$90/hr.
Exceptional Children Abstracts	8	1.3	$25/hr.
Predicast	6	1.0	$90/hr.
Oceanic Abstracts	3	.5	$55/hr.
ISMEC	1	.2	$45/hr.
CLAIMS/CHEM	1	.2	$150/hr.

N = 611

(The percentages in Table 16 do not add up to 100 because one search is sometimes done on more than one data base. However, the average search during the pay period was done on one data base.)

Table 17 presents, for both custom and standard searches*, the total number of searches completed by the four libraries between June 1, 1975 and May 31, 1976 (see Figure 3 for trend line), the average search time for one question, and the average number of on-line and off-line citations printed per search.

The results presented in Table 17 indicate that the number of standard searches being conducted remained fairly steady throughout the pay period. However, the number of custom searches being conducted increased from a low of 19 in June, 1975 to a high of 103 by March, 1976 and dropped back to 69 in May, 1976. Search times also remained fairly constant, averaging about 18.10 minutes for standard searches and 15.90 minutes for custom searches. For standard searches, the number of citations printed per search averaged 9.11 for on-line citations (with a standard deviation of 10.25) and 16.87 for off-line citations (with a standard deviation of 36.37). For custom searches, the number of citations being printed per search averaged 3.42 for on-line citations (with a standard deviation of 10.76) and 88.89 for off-line citations (with a standard deviation of 190.25).

The fixed cost of a standard search is $5.00. The unsubsidized cost of an average custom search, based on an average data base access rate of $40-$50 per hour and an average search time of 16 minutes, ranged

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* Two types of search were offered: "standard" searching of a single data base at $5 or an unrestricted "custom" search charged at one-half the usual DIALOG rate.

TABLE 17

MEAN SEARCH TIME AND CITATIONS - TOTAL FOR ALL LIBRARIES
(Pay Period: June 1, 1975 through May 31, 1976)

	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	TOTAL
Number of Searches													
Standard	9	11	8	10	6	7	3	5	2	9	11	8	89
Custom	19	24	34	46	65	57	43	55	66	103	77	69	658
Average Search Time (in minutes)													
Standard	19.63	13.63	14.46	18.21	11.20	15.01	22.95	18.89	30.64	14.76	*	*	18.10
Custom	14.64	9.07	13.87	12.18	12.62	13.52	16.75	15.35	16.46	15.93	*	*	15.90
Online Citations Per Search													
Standard	13.44	10.55	13.00	10.90	6.33	8.00	26.00	14.80	15.50	9.33	0.0	0.0	9.11
Custom	5.37	.92	6.65	2.26	4.82	4.88	9.16	5.58	3.62	2.53	0.0	0.0	3.42
Offline Citations Per Search													
Standard	18.78	4.55	7.63	25.80	8.83	30.71	9.00	28.80	0.00	9.67	24.46	21.00	16.87
Custom	52.37	105.71	80.50	94.48	82.63	77.74	75.21	90.89	81.58	84.42	93.04	125.83	88.89

*Due to computer output problems, it was not possible to accurately calculate average search times for April and May.

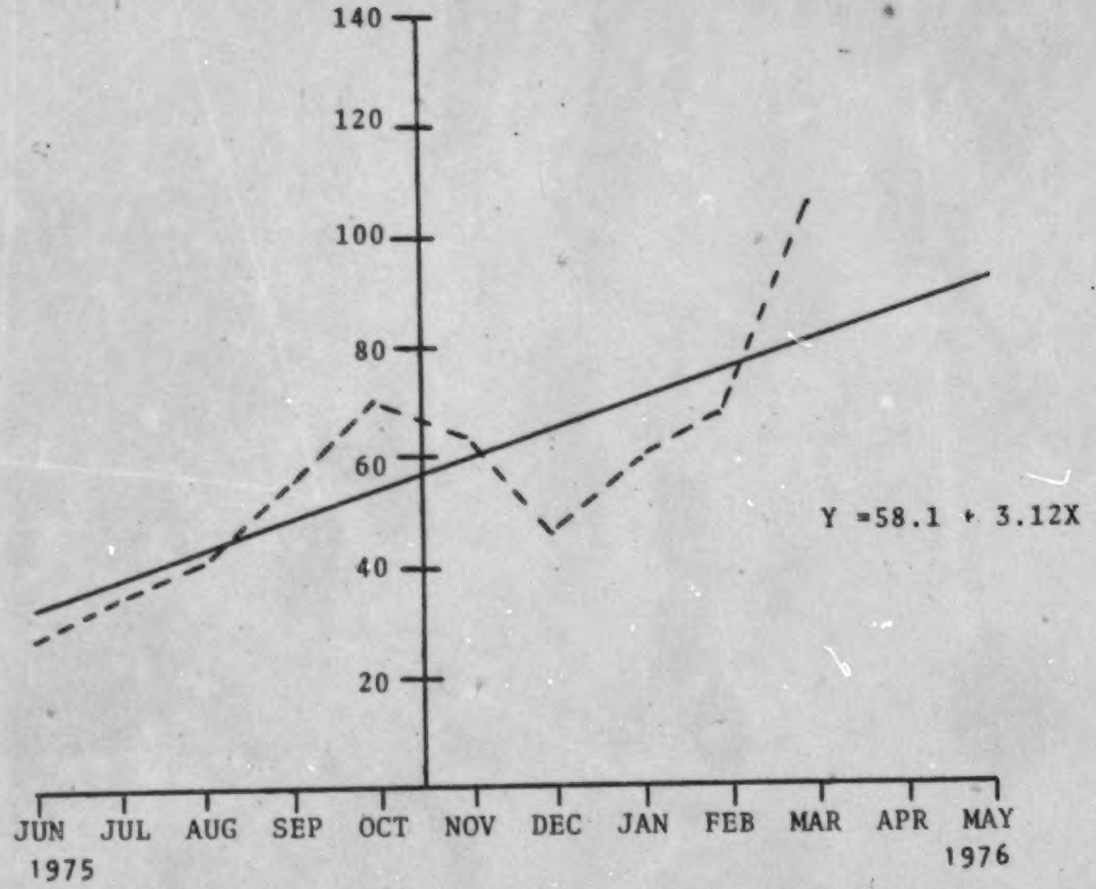

FIGURE 3. TREND LINE FOR TOTAL NUMBER OF DIALOG SEARCHES - PAY PERIOD

from $10.80 - 13.50. The average number of off-line citations printed out per search was 89, which represents an additional cost of $3.56 - 8.90 per custom search. The average, unsubsidized, custom search may vary, therefore, from $10.80 to $22.40 (excluding staff time and fixed expenses). Table 18 lists actual costs to the patron of DIALOG searches. (Note: During this pay period, patrons were charged one-half the cost of on-line search time.)

TABLE 18

COST OF SEARCH TO PATRON
(Pay Period: June 1, 1975 through May 31, 1976)

COST (in dollars)	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
$0 - 4.99	42.5%	23.0%	6.8%	11.9%	25.9%
5 - 9.99	35.0	29.1	25.0	44.3	35.4
10 - 14.99	8.0	11.5	4.5	14.2	10.5
15 - 19.99	4.0	10.3	9.1	11.4	8.2
20 - 24.99	1.8	3.6	2.3	2.8	2.6
25 - 29.99	.4	3.0	4.5	1.1	1.6
30 - 39.99	.4	4.8	4.5	2.3	2.5
40 - 49.99	.9	3.0	2.3	1.7	1.8
> $50	1.3	4.2	9.1	6.3	4.1
N =	226	165	44	176	611

Staff Time*

As during the free period, provision of an on-line service continued to require a great deal of staff time. In addition to the actual time spent at the terminal, librarians estimated that about 50% of all searches required from 5-25 minutes of off-line preparation time. Another 29% required 30 minutes or more of off-line time. Table 19 shows off-line preparation time broken down by library.

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* See Footnote, page 20.

TABLE 19

OFF-LINE SEARCH PREPARATION TIME* BY LIBRARY
(Pay Period)

MINUTES	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
0	8.8%	40.0%	20.5%	13.1%	19.3%
5-10	27.0	12.1	27.3	9.6	18.0
15-25	43.8	32.1	18.2	25.6	33.6
30-35	13.2	9.7	13.6	19.9	14.3
40-45	2.7	3.6	13.6	11.3	6.3
50-65	3.5	1.8	6.8	14.2	6.4
70-90	.8	.6	0.0	7.2	2.4
N =	226	165	44	176	611

* Off-line times were consistently reported in blocks of five minutes. Table 19, therefore, reports time estimates in discrete intervals.

Data from the pay period continued to indicate that most on-line search service patrons were not members of one of the four libraries conducting searches. Only 29.8% of DIALOG patrons held cards from one of the four participating libraries, 54.1% were members of libraries not participating in Project DIALIB, and 11.2% were not members of any library.

Search Results and Source Documents

Table 20 indicates the number of days it took the patron to receive the results of a DIALOG search from the time the search request was submitted.

TABLE 20

TIME FOR PATRON TO RECEIVE CITATIONS BY LIBRARY
(Pay Period)

DAYS	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
1	10.9%	5.7%	0.0%	14.0%	8.7%
2-7	80.3	82.9	52.7	51.1	70.2
8-14	8.7	5.7	26.4	23.3	13.6
15-21	0.0	1.9	15.8	7.0	4.3
22-42	0.0	3.8	5.3	2.3	3.2
N =	46	53	19	43	161

Librarians estimated that it took two days to receive off-line citations from Lockheed. Noticeable differences continued to exist between libraries. San Jose and Santa Clara County provided 90% of their patrons with search results in less than one week. Redwood City provided 65% of its patrons with search results in one week or less. At San Mateo, about 52% of DIALOG patrons received search results in one week or less. These differences will be discussed in Chapter V.

The time required to locate source documents did not appear to be a major drain on staff time. As indicated in Table 21, the majority of documents were not obtained through the library at which the search was completed. While a wide variety of sources continue to be used, academic libraries (including Stanford) ranked highest at 49.7% as suppliers of documents. Only 22.4% of DIALOG patrons indicated that they obtained documents through the library at which the DIALOG search was conducted.

TABLE 21

SOURCES THROUGH WHICH DOCUMENTS ARE OBTAINED
(Pay Period)

SOURCE	PER CENT OF TOTAL
College Library	44.1%
Library at Which DIALOG Search is Made	22.4
Branch Library	8.1
Stanford University	5.6
NTIS	3.1
Bookstore	3.1
Publisher	2.5
San Mateo County Office of Education	1.9
Company Library	1.9
State Mental Health Department	1.2
San Mateo County Health and Welfare Department	1.2
Authors Directly	1.2
Veterans Administration Medical Library	.6
Personal Collection	.6
State Game Department	.6
	N = 161

About 50% of on-line search service patrons stated that the results of their DIALOG search indicated additional questions of interest to them. Of these individuals, 36.7% indicated that they either already had or intended to look for information on these new topics. Of these individuals, 9.3% returned for information to the library at which the search was conducted and another 4% had an additional on-line search done.

USAGE PATTERNS - PAY PERIOD

User Characteristics

Table 22 provides a breakdown of on-line service users by occupation. The two principal classes of users were graduate students and individuals in the field of education (including teachers, professors and school administrators). The next two major classes of users were technical professionals (including engineers, computer specialists, etc.) and college students. Nearly 81% of these patrons indicated that they had not had any previous experience with DIALOG, and about 74% indicated that they had not had prior experience with any on-line retrieval system. For patrons who stated that they had used DIALOG previously, Table 23 indicates the number of prior uses of the system.

TABLE 23

NUMBER OF TIMES DIALOG USED PREVIOUSLY
(Pay Period)

NUMBER OF TIMES	PER CENT OF PATRONS
1	11.8%
2	1.9
3	3.1
>4	2.4

The data in Table 24 indicate that the majority of searches were done for research papers or as part of the patron's job.

TABLE 22

OCCUPATION OF DIALOG CLIENTS BY LIBRARY
(Pay Period)

OCCUPATION	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Graduate Student	17.3%	12.1%	18.2%	25.0%	18.2%
Education	23.9	16.4	4.5	11.4	16.9
Technical Professional	13.3	15.2	6.8	9.7	12.3
College Undergraduate Student	4.4	7.3	11.4	17.0	9.3
Librarian	5.3	13.3	13.6	6.3	8.3
Professional (e.g., M.D., Lawyer, Psychologist)	2.7	3.6	25.0	6.8	5.7
Business Professional	4.0	6.7	4.5	4.5	4.9
Scientist or Research	2.2	3.0	2.3	5.7	3.4
Counselor	3.5	1.8	0.0	.6	2.0
Social Worker	.4	4.2	0.0	1.7	1.8
Nurse	1.3	2.4	4.5	0.0	1.5
Government Employee	1.3	1.2	0.0	1.1	1.1
Writer	0.0	1.8	2.3	1.1	1.0
Skilled Labor	0.0	0.0	0.0	1.1	.3
Other	3.3	1.8	2.3	2.4	2.7
	N = 226	165	44	176	611

TABLE 24

REASON FOR DIALOG SEARCH BY LIBRARY
(Pay Period)

REASON FOR SEARCH	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Research Paper	48.2%	30.3%	40.9%	48.3%	42.9%
Job	27.9	45.4	38.6	21.1	31.5
School Assignment	12.4	5.5	6.8	7.4	8.7
Personal Interest	3.5	4.2	4.5	5.7	4.4
Graduate Degree Program	3.1	4.2	2.3	6.3	4.3
Book	.4	.6	0.0	.6	.5
Research & Development	0.0	0.0	0.0	.6	.2
N =	226	165	44	176	611

Table 25 indicates the average level of education of the on-line search service patron. About 33% of DIALOG patrons had some graduate work and another 23% hold advanced degrees.

TABLE 25

LEVEL OF EDUCATION OF DIALOG CLIENT
(Pay Period)

LEVEL OF EDUCATION	PER CENT OF TOTAL
Ph.D. or M.D.	5.9%
Masters Degree	17.8
Graduate Student or Graduate Work	33.4
College Graduate	11.8
College Student	9.7
High School Student	.3
	N = 611

In addition, nearly 47% of DIALOG users were male and over 68% were between the ages of 20 and 40.

As shown in Table 26, over 44% of DIALOG patrons use the public library only monthly, several times a year, or not at all.

TABLE 26

ESTIMATED FREQUENCY OF LIBRARY USE BY DIALOG PATRONS
(Pay Period)

FREQUENCY	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Daily	2.2%	3.8%	31.6%	2.3%	6.2%
Weekly	23.9	30.2	21.1	27.9	26.7
Several Times a Month	19.6	15.1	10.5	20.9	17.4
Monthly	13.0	11.3	5.3	23.3	14.3
Several Times a Year	32.6	32.1	26.3	14.0	26.7
Not At All	6.5	5.7	0.0	0.0	3.7
N =	46	53	19	43	161

The data in Table 27 indicate that about 61% of DIALOG patrons normally use the reference service several times a year or not at all.

TABLE 27

ESTIMATED FREQUENCY OF REFERENCE SERVICE USE BY DIALOG PATRONS
(Pay Period)

FREQUENCY	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Daily/Weekly	2.2%	11.3%	10.5%	4.7%	6.8%
Several Times a Month	15.2	13.2	15.8	9.3	13.0
Monthly	2.2	17.0	5.3	14.0	10.6
Several Times a Year	60.9	39.6	42.1	48.8	48.4
Not At All	13.0	13.2	15.8	11.6	13.0
N =	46	53	19	43	161

Finally, Table 28 indicates estimated frequency of future use of an on-line search service by patrons who have already used DIALOG.

TABLE 28

ESTIMATED FREQUENCY OF FUTURE DIALOG USE
(Pay Period)

FREQUENCY	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Daily/Weekly	0.0%	1.9%	0.0%	0.0%	.6%
Several Times a Month	4.3	1.9	5.3	2.3	3.1
Monthly	4.3	5.7	5.3	9.3	6.2
Several Times a Year	78.3	86.8	84.2	76.7	81.4
Not At All	6.5	1.9	0.0	2.3	3.1
N =	46	53	19	43	161

Only 3.1% of DIALOG patrons indicated that they would have no future use for an on-line service.

Search Questions

The types of questions being asked by users continued, as during the free period, to be highly complex questions dealing with a wide variety of subjects. A one-month tabulation of search titles, given in Figure 4, indicates the types of questions submitted.

Search Value

Table 29 indicates patron estimates of the value of a DIALOG search to them.

FIGURE 4. SEARCH TITLE GROUPED BY GENERAL CATEGORY - PAY PERIOD

PSYCHOLOGY

- Mental Retardation
- Aggression
- Assertiveness
- Personality
- Existential Theory
- Mothers
- Psychodiagnosis
- Suicide
- Employee Motivation
- Discrimination
- Bibliotherapy

EDUCATION

- Community Colleges
- Development of Language in Children
- Reading Disabilities
- Criterion-referenced Testing
- Bibliotherapy
- Reading Specialists
- Deaf Children
- Learning Processes
- Instructional Design
- Elementary School Libraries
- Classroom Observation Techniques
- Student-Teacher Relationship
- Mathematics Instruction
- Athletics
- Negro Colleges
- Vocational Interest

BIOLOGY/MEDICINE

- Amino Acids
- Radiobiology
- Contact Lenses
- Biomedicine
- Steroids

ENGINEERING/SCIENCE

- Trickling Filters
- Molten Scrubbing
- Dust Explosions
- Motor Boats
- Electronarcosis
- Interferometers
- Electrical Equipment
- Gas Chromatography
- Earthquake Prediction
- Glaciers
- Transient-turbulent-model
- Library Automation
- Ballistic Missiles
- Electric Power Plants
- Aerosols
- Heavy Water
- Acoustic Phonetics
- Electrodynamics

SOCIAL SERVICES

- Suicide Prevention
- Foster Homes
- Volunteers
- Drug Abuse
- Urban Planning
- Information Dissemination
- Fringe Benefits

AGRICULTURE

- Sugar Cane
- Bananas

OTHER

- Photojournalism
- Consumer Price Index

TABLE 29

VALUE OF SEARCH TO PATRON
(Pay Period)

VALUE OF SEARCH	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Major Value	32.6%	24.5%	42.1%	16.3%	26.7%
Considerable Value	52.2	49.1	31.6	46.5	47.2
Minor Value	15.2	20.8	21.1	30.2	21.7
No Value	0.0	5.7	0.0	7.0	3.7
N =	46	53	19	43	161

The data indicate that about 74% of DIALOG patrons felt that the results of their search were of considerable or major value to them.

The data in Table 30 indicate that almost 60% of DIALOG patrons felt that the results of their search provided sufficient references to answer their question adequately.

TABLE 30

SUFFICIENT REFERENCES PROVIDED TO ANSWER QUESTION ADEQUATELY*
(Pay Period)

QUESTION ANSWERED ADEQUATELY?	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Yes	71.7%	54.7%	63.2%	51.2%	59.6%
No	28.3	43.4	31.6	48.8	39.1
N =	46	53	19	43	161

*Insufficient references may be located due to lack of information available in the data bases, searcher expertise, inadequate explanation by patron of information needs, etc.

Table 31 indicates the number of citations that were actually of use to the patron.

TABLE 31

NUMBER OF CITATIONS OF USE TO PATRON
(Pay Period)

NUMBER OF CITATIONS	PER CENT OF TOTAL RESPONSES
0	12.4%
1 - 5	24.9
6 - 10	16.7
11 - 15	8.1
16 - 20	6.1
21 - 50	21.0
More than 50	3.0
	N = 161

Publicity

Finally, Table 32 indicates sources through which patrons heard about the availability of the on-line service. Librarians and friends continued to be the major publicity sources for the service, followed in rank by professors and notices in the library.

TABLE 32

SOURCE THROUGH WHICH PATRON HEARD ABOUT ON-LINE SEARCH SERVICE AVAILABILITY
(Pay Period)

SOURCE	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY	TOTAL
Public Librarian	21.2%	23.0%	36.4%	25.0%	23.9%
Friend	24.3	23.6	9.1	21.6	22.3
Professor	21.7	15.2	13.6	15.9	17.7
Notice in Library	10.2	4.2	15.9	8.0	8.3
College Librarian	8.4	6.7	4.5	9.1	7.9
Newspaper	1.3	1.8	2.3	4.0	2.3
CIN Mailing	0.0	5.5	0.0	0.0	1.5
Mailed Notice	.4	0.0	0.0	2.8	1.0
Club Meeting	.4	0.0	2.3	0.0	0.3
N =	226	165	44	176	611

COMPARISON OF FREE VS. PAY PERIOD

The data presented in the previous sections indicate some differences in search statistics, usage patterns and user characteristics between the free period and the pay period. These differences are identified and discussed in the following section.

With the exception of number of searches performed, none of the differences between variables discussed below are unexpectedly dramatic. In other words, most search statistics, user patterns and user characteristics changed only slightly. It might be surmised from the comparisons that follow, then, that the introduction of user fees had little impact on either the user or the library--except to initially reduce the volume of searches being performed.

It is also important to keep in mind that explanations for observed differences are merely speculation. The lack of experimental controls on the four libraries made it impossible to attribute any kind of cause and effect to relationships that appear to exist between variables. However, for the benefit of future experimental work, it is useful to indicate possible relationships that require further exploration.

SEARCH STATISTICS

On-line Search Statistics

Major differences in on-line search statistics include number of searches completed, average search time, average number of off-line citations printed per search, frequency of data base use, and average number of data bases used per search.

Number of Searches: During the peak month of the free period, the four libraries completed a total of 385 searches. The number of searches completed during the peak month of the pay period totaled 112. As expected, the number of search requests dropped precipitously in June, 1975, when charges were introduced. However, the total number of searches being conducted each month during the pay period increased fairly steadily, from 28 searches in June, 1975 to a high of 112 searches in March, dropping back to 77 searches in May.

Average Search Time: Searches conducted during the free period required an average of 22 minutes per search. However, average search times decreased steadily over the nine-month free period, dropping from a high of 31.28 minutes in September, 1974, to 18.69 minutes in May, 1975.

The average search time for custom searches completed during the pay period was 15.90, slightly under 3 minutes less per search than free searches completed in May, 1975. The reasons for this difference were probably due both to an increase in competence on the part of the library staff and to a concern for keeping the cost down.

Citations Per Search: The number of on-line citations printed per custom search during the pay period (3.42) was well below the average 14.27 on-line citations printed during the free period. Off-line citations, however, averaged 88.89 for custom searches as opposed to 55.83 for searches conducted during the free period. Again, cost concerns probably entered strongly into the decision of librarians to produce fewer on-line citations, choosing instead to print these off-line. The increase in off-line citations might also be attributed partly to an increase in expertise and greater data base familiarity on the part of the DIALOG operators.

Frequency of Data Base Use: The most notable difference in data base use was the increased demand for ERIC during the pay period. In fact, ERIC replaced NTIS as the most frequently accessed data base. NTIS moved into the number three position occupied by ERIC during the free period.

Data Bases Used Per Search: During the free period, the average number of data bases used per search was two. The average number of data bases used per search during the pay period dropped to one (for custom searches). Again, cost concerns were probably the primary consideration. During the free period, librarians had more inclination to experiment with other data bases, even when they were uncertain about the kinds of information available through these data bases. With the introduction of charges, librarians could be expected not to "waste" the patron's money by exploring unknown data bases.

Staff Time

The principal difference in this category occurred in off-line preparation time.

Off-line Preparation Time: Librarians estimated that they spent more time off-line preparing for a search during the pay period than they did during the free period. In fact, during the free period, 45.7% of all searches involved no off-line preparation time as opposed to 19.3% of all searches conducted during the pay period. The percentage of searches requiring from 15-25 minutes of off-line time nearly doubled during the pay period. And the percentage of searches requiring from 30-35 minutes of off-line time nearly tripled during the pay period. Again, the reason for this increase in off-line preparation time can probably be attributed to the librarian's concern about search costs.

Search Results and Source Documents

Some differences occurred in the time required to receive the results of a search and in the sources used to obtain documents.

Time for Patron to Receive Citations: Differences between libraries in the time it takes the patron to receive search results after submitting the search request were the most notable variation for both time periods. Generally, however, the time which elapsed before the patron received results was reduced at all libraries. During the free period, about 50% of DIALOG patrons received search results in one week or less. The percentage of patrons who received results in one week or less increased to 79% during the pay period. San Jose provided the single most striking change. During the free period, nearly 70% of DIALOG patrons waited two or more weeks to receive search results. San Jose provided 90% of DIALOG patrons with search results in one week or less during the pay period. The overall reduction in time is probably principally due to the fact that all libraries were conducting fewer searches per month during the pay period than during the free period. This meant staff could handle search requests more promptly. Interlibrary differences will be discussed more fully in Chapter V.

Sources Used to Obtain Documents: The major change in sources was the increase in use of college libraries to obtain documents. In fact, use of college libraries (including Stanford) jumped from 33% during the free period to 46.5% of patrons during the pay period. Use of the library at which the DIALOG search was completed to obtain documents decreased from 29.9% of patrons during the free period to 22.4% during the pay period. The principal reason for this change is probably the concurrent change in patron occupations. A larger percentage of DIALOG patrons during the pay period were graduate students. These individuals would be more likely to return to their own college library to obtain documents than to go through a public library.

USAGE PATTERNS

The principal users of the system, the reasons these users require DIALOG searches, and user satisfaction with search results also show differences between the free and pay periods.

User Characteristics

Occupation: The percentage of patrons falling into the graduate student category increased noticeably during the pay period. In fact, graduate students replaced technical professionals as the highest percentage of users. The percentage of educators and librarians using the system also increased. There are no obvious reasons for the increase in system use by graduate students and the relative drop in use by technical professionals. One possible explanation is the reduction in publicity. Word-of-mouth became the primary publicity source during the pay period, particularly from friends, professors and librarians. Newspaper publicity and mailed notices were almost eliminated as sources during the pay period. Thus, it is possible that the decrease in the percentage of technical professionals using the system is mainly dependent on the reduction in publicity efforts.

Reason for Search: After noting the changes in occupations of users, it is not surprising to see that the reasons users conduct searches also changed slightly. In fact, "research paper" replaced "job" as the principal reason for conducting an on-line search. Actually, the percentage of patrons conducting searches as part of their jobs did not alter appreciably. However, the percentage of patrons conducting searches for research papers increased by about 10% during the pay period. This is certainly directly related to the increase in system use by graduate students.

Search Value

While the overall value of the search to the patron remained fairly constant between the free and pay periods, some changes did occur in patron responses to a question asking if the results of their search provided sufficient references to answer their question adequately.

Sufficient References to Answer Question Adequately: During the free period, 53% of DIALOG patrons stated that the results of their search provided sufficient references to answer their question adequately. During the pay period, this percentage increased to almost 60%. It is not possible to isolate all the reasons that may have contributed to this change. Certainly, an increase in librarian on-line expertise and improvements in reference interview techniques may be important factors. However, it is also possible that search questions submitted during the pay period were more suited to the data bases available on-line or differed in some other important respect from questions submitted during the free period. Unfortunately, the available data do not permit a clarification of these possibilities.

Number of Useful Citations: The number of citations actually of use to the patron also increased during the pay period. Only about 12% of patrons indicated that no useful citations were received during the pay period, as opposed to almost 18% of patrons during the free period. Also, nearly 21% of DIALOG patrons during the pay period indicated that 21-50 citations were of use to them--an increase of almost 11% over the free period. Again, it is not easy to determine the exact factors contributing to these changes. Searcher expertise may be relevant or the change might be due mainly to differences in question topics.

Publicity Source

Finally, publicity sources did change somewhat during the pay period. Public librarians and friends remained comparable during both periods as primary publicity sources. However, professors replaced library notices as the third most frequently cited source and newspaper sources dropped from almost 11% to 2.3% during the pay period. The large percentage drop for newspapers as a source is easily explained by the fact that news coverage of the project occurred only during the first year of the experiment. The large increase in professors as a source has no obvious explanation which can be derived from the available data.

LIBRARY IMPACT

The introduction of computerized search services has had little overall impact on the libraries participating in the experiment (at least, not within the two-year study period). Provision of the on-line service did, however, have a substantial impact on reference service staff responsible for conducting searches. The entire search process* including query negotiation with the patron, off-line preparation time, on-line search time, relaying search results to the patron, location of source documents, and billing (during the pay period) required substantial amounts of staff time. In addition, individual staff members spent a great deal of time, initially, learning system operation and data base organization. Reference librarians continue to spend time maintaining and improving their on-line expertise and learning new data bases. Each of these factors are discussed more fully in the following section. The effect of the on-line service on library policy and administration generally is less noticeable at this point in the project.

Impact on Reference Service

The major impact of the new service was the increased work load and the accompanying stress imposed on the reference staff. No extra staffing was provided for the project at any of the libraries (with the exception of the San Jose State graduate student who performed searches part-time during the free period at the San Jose Public Library). During the free period, most libraries indicated that the professional workload increased by about 20 hours per week. The reduction in the number of search requests received during the pay period did help to reduce this workload. There are a number of factors which have contributed to the high demand on staff time:

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* See Footnote, page 20.

1. By the end of the free period, the libraries were averaging from 72-96 searches per month, requiring from 20-30 minutes per search of on-line time. In addition, about 44% of all searches completed during the free period required from 5-25 minutes of off-line preparation time and another 10% required from 30-90 minutes. By the end of the pay period, libraries were averaging from 20-28 searches per month, requiring from 16-18 minutes per search of on-line time. For all searches completed during the pay period, about 50% required from 5-25 minutes of off-line preparation time and about 30% required from 30-90 minutes of off-line preparation time.

2. Each search also required fairly extensive interaction between the librarian and the patron. Librarians assisted patrons requesting computer searches in specifying the exact nature of their requests, including keywords,

author names, possible data bases, and time limitations for their search. In many cases, librarians attempted to include the patron in the development of search strategy. This requires some often lengthy explanations of the search process by the librarian.

3. The location of source documents upon completion of the search is another potential demand on staff time. In the case of Project DIALIB, this has not proved to be a major difficulty for public library reference staff. Many patrons have located source documents on their own or through libraries other than the one at which the DIALOG search was completed. Still, almost 27% of DIALOG patrons during the free period and 22% of DIALOG patrons during the pay period did return to the library which conducted the search to locate documents. The affiliation of the libraries with the Cooperative Information Network (CIN) has been helpful in providing sources for some documents. It is still possible, however, that future demand for source documents might necessitate the development of new interlibrary loan policies.

4. During the pay period, staff were also responsible for calculating search costs. However, the introduction of on-line printout of search costs (which Lockheed has

now implemented) should eliminate this accounting task.

5. The introduction of computerized search services has increased patronage of the reference service at the libraries participating in the experiment (see Chapter IV, Search Statistics). However, most of these patrons are from outside the normal "service area" of the libraries providing DIALOG searches. In addition, librarians feel that most of these new patrons come into the public library only to use the on-line service. Still, some of these patrons, when coming into the library to request a DIALOG search, do discover the many other resources available through the public library for the first time. Many DIALOG patrons have expressed surprise at the quality of the reference service available through the public library.

6. The heavy demand for demonstrations of the service has also required a great deal of staff time. To many individuals, the retrieval terminal has had a certain novelty aspect and they request demonstrations primarily because of fascination with the new technology. During the first year, librarians felt that many users posed questions which were principally intended to test system capabilities rather than to provide the

user with necessary information. These problems should disappear when free demonstration time is no longer provided.

Impact on Reference Librarian

In addition to the impact on the reference staff generally, the on-line service has also had an effect on individual librarians who conduct searches.

1. Aside from negotiating a search request with the patron and actually conducting the search, each librarian is also responsible for maintaining a certain level of familiarity with the actual operation of the system. This means reading the training manual to learn both effective search strategies and use of search terms and to learn more efficient procedures for conducting searches.

2. Librarians are responsible for learning the organization and content of new data bases added to the system and for maintaining proficiency in searching each data base.* This seems to be a particular strain on public librarians. Most staff felt that the diversity and range of subjects covered in on-line search requests

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* This is also true, of course, for hard copy versions of data bases and for all new reference tools.

posed a problem unique to public library reference staff. Reference librarians need to be competent or skilled in searching some 30-40 data bases to handle such subject diversity (although library service policies could restrict searches to a limited number of bases). Search competence depends on a thorough knowledge of both data base organization and optimal search strategies for each data base. Many of the staff felt that these problems would not be as intense in special library situations where the reference service is aimed at restricted user groups focusing on one or two major subject areas.

3. Reference librarians have indicated that the use of computerized search services gives them a new feeling of competence in dealing with technical reference questions they would have been unable to answer without the service. They have also indicated that use of the system has been a highly educational experience. Through manipulation of keywords and retrieval of references, librarians are becoming more aware of the latest developments in a number of technical fields and are often able to provide even patrons who do not request computer searches with more up-to-date information.

Impact on Library Policy

The third major impact on the library depends on the policy the library adopts to cover the cost of the service. Project DIALIB libraries have chosen, during the pay period, to pass half the cost of on-line search time plus the cost of printing off-line citations on to the patron. However, a number of alternatives are available.

1. If a library decides to include the cost in their current budget and continue to provide free searches, this could have some effect on library policy. Administrators should keep in mind that provision of a free on-line service cuts into funds and staff time available for the establishment and/or operation of other services. The heavy demand for searches would certainly necessitate either the hiring of additional staff to conduct computer searches or the establishment of a policy limiting system use according to some criterion determined by the administration.

2. Should a library decide to pass some portion or all of the cost of the service on to the patron, there could be some impact due to the need for a structure capable of dealing with billing and fee collection. The "cash and carry" policy adopted by the libraries during the pay period seems to have had little effect on general library operations. The main impact of the policy was to increase the demand on reference staff time, as certain staff members were

responsible for calculating search costs. (Since DIALOG now prints search costs on-line, reference librarians should no longer be responsible for cost calculations.)

In some instances, organizations did deposit funds with the library to cover the cost of searches performed by employees. Such occurences were relatively infrequent, however. Thus, it is impossible to speculate on any long-term impact that might result from the development of such fee collection procedures.

3. Provision of fee-for-service computer searches may also require some rather important policy decisions. For instance, the library must determine if all patrons will be charged uniformly for the service or if patrons will be charged on a scale based on ability to pay (although most public librarians seem to feel that this second alternative is not feasible for a public library). If the library decides that the user should pay for the service, it must also decide if the patron should only pay for the cost of connect time to the data bases used in the search and for the cost of citations printed off-line, or if an additional fee should be charged to cover staff time, communication, and equipment costs.

Impact on the Community

The provision of computer search services has done little to increase the visibility of the public libraries in the communities they serve within the two-year period of the experiment. The on-line service has attracted patrons to the public library reference service. However, most of these patrons are from outside the community in which the public library providing the service is located. The data also indicate that on-line system patrons are not frequent users of the public library reference service. Instead, they are highly educated professionals and students.

Still, on a small scale, on-line service patrons have been introduced to new services and have expressed greater awareness and appreciation of new information technology and of the innovativeness of the public library. Once patrons utilize the service, they are quick to suggest a wide variety of additional data bases (see Figure 5) that they would like to see made available through the computer.

On-line search services do have the potential of providing reference support services to municipal government. In fact, during the first year of the project, the city manager of Redwood City stated for the first time that one of the services which the public library could provide was "back-up research for local government officials." And, in fact, some city agencies posed a number of technical questions to Project DIALIB librarians on subjects such as helicopter noise levels, redevelopment financing, patrol car maintenance, open channel flow of storm waters, and solar energy. However, the full potential has certainly not been realized as of the end of the second year of

Project DIALIB. In fact, Project DIALIB librarians at all four libraries were generally disappointed and discouraged about the lack of response from both municipal agencies and municipal government officials to the availability of the service. Several of the libraries made special efforts to provide city agencies with demonstrations of the on-line service. For instance, at the San Jose Public Library, the municipal reference librarian (who was among the first trainees and operators of the on-line service) was actively involved in publicizing the service to municipal agencies and in using DIALOG to answer reference questions submitted by such agencies.* The Santa Clara County Library, in addition to demonstrations, provided a fixed sum of money to cover searches requested by city agencies. In spite of the availability of these "free" searches, city agencies made little use of the service. In fact, most of the money allocated for such searches during the pay period was not used.

Generally, then, provision of an on-line service has had almost no observable impact on the communities served by the participating libraries, at least not on a short-term basis. The potential for a substantial impact remains, particularly if some of the additional data bases requested are made available (see Figure 5). However, as in the introduction of almost all innovations, any impact of an on-line service on a community will probably be evident only after a long, painstaking process involving education of both the public librarian and the public.

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* The San Jose Public Library is the only Project DIALIB participant which operates a municipal reference library staffed by a full-time professional librarian. Although little response occurred during the first two years of Project DIALIB, the library is experiencing a gradual increase in use of the on-line service to answer municipal agency reference questions.

FIGURE 5. ADDITIONAL COMPUTER DATA BASES REQUESTED BY DIALOG PATRONS

Minority Research
Social Science and Humanities
Historical References
Agriculture
Law
Psychiatry
Social Services Available in Santa Clara and San Mateo Counties
Consumer Information
Energy Source Alternatives
Economics
Affirmative Action
National Institute of Mental Health
Urban Planning Abstracts
Arts
Vocational Information
State and National Legislative Actions
Geotechnical Material
Library of Congress
Parapsychology
Biographical
Courses Available at Local Colleges
Current Technical Publications
Medical Information
Mathematics
Occupational Information
People Vitaes
Patents
New York Times Index
Water Resources Research
Marketing
Fiction
Building Codes
Psychopharmacology

V. INTERLIBRARY COMPARISONS

It is apparent from the data presented in the previous sections that there are major differences in on-line service operation and use among Project DIALIB libraries. These differences are identified and discussed for the free period and the pay period separately in the following section.

Actually, interlibrary differences remained fairly comparable between periods. During both the free and the pay period, libraries differed in terms of number of searches conducted, average search time, and average number of on-line and off-line citations printed (see Appendix B for a comparison of group means). Library patrons at each library also showed differences in occupation, reason for search, the method through which the patron heard about the availability of the service, the value of the search to the patron and patron responses to a question asking if the results of the search provided sufficient references to answer their question adequately (see Appendix B). There were also very noticeable variations between libraries in terms of client availability at the time of the search and in the time which elapsed between submission of the search request by the patron and subsequent receipt of the search results.

It is important to remember that reasons presented for differences between libraries are only speculative. In the absence of experimental controls, it is not possible to attribute "cause and effect" to apparent relationships between variables. Postulated reasons for differences are "educated guesses" based on two years of observation and participation in Project DIALIB.

PROJECT DIALIB LIBRARIES - FREE PERIOD

The data presented in Table 33 indicate interlibrary differences in number of searches performed, average search time, and number of citations printed both on-line and off-line.

TABLE 33

SEARCH STATISTICS BY LIBRARY - FREE PERIOD
(September, 1974 through May, 1975)

	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY
Number of DIALOG Searches (Total)	426	422	381	691
Average DIALOG Search Time (in Minutes)	24.14	27.85	17.05	19.98
Average Number of Online Citations (per search)	16.00	19.84	12.08	11.09
Average Number of Offline Citations (per search)	37.80	93.65	23.48	62.29

Redwood City did by far the largest number of total searches, completing about 300 more searches than any of the other libraries participating in Project DIALIB. The other three libraries were fairly even in terms of total number of searches performed.

Santa Clara had the largest average search time and also the largest average number of on-line and off-line citations printed. San Mateo had the shortest search time and also the least number of off-line citations printed. Both San Mateo and Redwood City printed smaller numbers of on-line citations than the other two libraries (see Appendix B for a comparison of group means). As indicated earlier in Table 4, the largest percentage of DIALOG patrons at both San Jose and San Mateo did not receive the results of their searches until one to two weeks after the request was submitted. Santa Clara and Redwood City both returned the results of DIALOG searches to the majority of their patrons in less than one week. Santa Clara alone returned almost 27% of their search results in one day.

There were also marked differences in terms of availability of the client at the time of the search, as indicated in Table 34.

TABLE 34

CLIENT AVAILABILITY AT TIME OF SEARCH
(Free Period)

	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY
Client Present at Search	7.1%	53.0%	2.5%	18.5%
Client Available by Phone At Time of Search	14.3	15.8	3.0	5.0
Client Not Available at Time of Search	75.8	30.1	70.7	67.9
N =	252	266	198	520

At Santa Clara, 53% of the patrons were present at the library at the time their search was conducted. At all other libraries, well over 65% of the patrons were not available at the time their search was conducted by the librarian.

Finally, about 65% of DIALOG patrons picked-up the results of their searches at the library at which the search was done in three cases, as indicated in Table 35. At San Mateo, however, nearly 50% of the search results were mailed to branch libraries.

TABLE 35

METHOD USED TO PROVIDE PATRON WITH SEARCH RESULTS
(Free Period)

	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY
Search Results Picked-Up at DIALOG Library by Client	68.3%	65.8%	24.2%	65.6%
Search Results Picked-Up at Branch Library	.4	3.4	56.6	1.7
Search Results Mailed to Client	15.9	24.1	6.6	18.7
N =	252	266	198	520

The most notable difference in user occupations at the four libraries is the comparatively high percentage of technical professionals that had searches done at Santa Clara (Table 6). Redwood City also had a higher percentage of technical professionals than the remaining two libraries, although this figure is not nearly as striking as Santa Clara's. A high percentage of the searches done at San Mateo and Santa Clara were also done as part of the patron's job (Table 7).

San Jose fell far short of the other three libraries in terms of the percentage of patrons who heard about the availability of the service through the librarian (Table 15). In fact, at all other libraries, librarians were the principal source of publicity for the service. In contrast, most patrons at San Jose heard about the service through friends. Furthermore, notices in the libraries were a major publicity source at all libraries except San Jose.

There were some differences between libraries in user ratings of the value of DIALOG searches to them, as indicated earlier in Table 12. Patrons at San Mateo, in particular, rated fewer searches as being of major value than did patrons at the other three libraries. Also, slightly more patrons at San Mateo rated searches as having no value. Also, in comparison to the other three libraries, from 7-10% fewer DIALOG patrons at San Mateo stated that the results of their search provided sufficient references to answer their question adequately (Table 13).

PROJECT DIALIB LIBRARIES - PAY PERIOD

The data presented in Table 36 indicate interlibrary differences in number of searches conducted, average search time, and number of citations printed both on-line and off-line.

TABLE 36

SEARCH STATISTICS BY LIBRARY - PAY PERIOD
(June, 1975 through May, 1976)

	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY
Number of DIALOG Searches				
Standard	19	8	32	30
Custom	252	170	44	192
Total	271	178	76	222
Average DIALOG Search Time (in minutes)				
Standard	21.01	16.16	17.68	17.00
Custom	11.79	17.31	24.69	17.98
Average Number of Online Citations (per search)				
Standard	9.84	10.13	8.88	8.63
Custom	3.68	2.86	13.16	1.35
Average Number of Offline Citations (per search)				
Standard	7.74	29.50	20.16	15.77
Custom	46.68	147.05	67.11	97.79

San Jose completed the largest total number of searches at 271 (from 49-195 more searches than any of the other libraries). San Mateo County completed the least number of searches, a total of 76, during the pay period.

For custom searches, San Jose also had the smallest average search time and the smallest number of off-line citations printed per search. San Mateo, alternately, had the largest average search time and the largest number of on-line citations printed per search. Actually, the means for off-line citations printed at San Jose and San Mateo did not differ significantly (see Appendix B).

As indicated in Table 20, 52% of DIALOG patrons at San Mateo received the results of their searches in one week or less after the request was submitted. In contrast, San Jose and Santa Clara provided about 90% of their patrons with search results within one week. Redwood City provided about 79% of their patrons with search results in one week or less.

There were also marked differences in terms of availability of the client at the time of the search, as indicated in Table 37.

TABLE 37

CLIENT AVAILABILITY AT TIME OF SEARCH
(Pay Period)

	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY
Client Present at Search	61.5	84.8	11.4	34.1
Client Available by Phone at Time of Search	1.3	3.6	2.3	2.3
Client Not Available at Time of Search	32.7	10.3	77.3	60.2
N =	226	165	44	176

At Santa Clara, nearly 85% of DIALOG patrons were present at the library at the time their search was conducted. San Jose ranked second, with almost 62% of DIALOG patrons being present at the time of their search. At San Mateo over 77% of DIALOG patrons were not available at the time their search was conducted.

Also, as indicated in Table 38, about 34% of DIALOG patrons at San Mateo picked-up the results of their search at a branch library. In the other three cases, less than 5% of DIALOG patrons picked-up search results at a branch library. Instead, about 70% of patrons at San Jose and Santa Clara and about 48% of patrons at Redwood City picked-up their search results at the library which conducted the DIALOG search.

TABLE 38

METHOD USED TO PROVIDE PATRON WITH SEARCH RESULTS
(Pay Period)

	SAN JOSE	SANTA CLARA	SAN MATEO	REDWOOD CITY
Search Results Picked-Up at DIALOG Library by Client	73.5	70.3	29.5	47.7
Search Results picked-up at Branch Library	.9	2.4	34.1	5.1
Search Results Mailed to Client	8.0	14.5	20.5	29.0
N =	226	165	44	176

Santa Clara continued to have the highest percentage of technical professionals (Table 22), although San Jose did not differ by much. Redwood City had by far the highest percentage of users falling into the graduate student category, while Santa Clara had the lowest percentage of users in this category. San Jose also had markedly higher percentage of users in the education category than did any of the other three libraries. The single highest percentage of users at San Mateo were professionals (M.D., lawyer, etc.).

At Santa Clara, as opposed to the other three libraries, the majority of searches were conducted as part of the patron's job. At all other libraries, the largest percentage of patrons listed research papers as the reason for their DIALOG search.

The most noticeable difference in publicity sources occurred at San Mateo (Table 32). Almost 14% fewer patrons at San Mateo listed friends as the source through which they heard about the availability of the service compared to the other libraries. Similarly, from 6-10% more patrons at San Mateo listed notices in the library and from 10-15% more patrons listed librarians as their information sources at San Mateo. San Jose (which is located a short distance from San Jose State College) had a much higher percentage of patrons listing professors as a publicity source than any of the other libraries.

San Mateo did have the highest percentage of patrons stating that their searches were of major value to them (Table 29). However, at San Jose 85% of DIALOG patrons stated that their searches were of considerable or major value. Redwood City had the lowest percentage (about 62%) of patrons falling into the major and considerable value categories combined.

Also, Redwood City and Santa Clara had the lowest percentage of patrons stating that their searches provided sufficient references to answer their question adequately. San Jose had the highest percentage of patrons stating that the results of their search provided sufficient references to answer their question adequately.

LIBRARY PROFILES

In order to determine some of the factors which contributed to these differences, DIALOG librarians at all libraries were interviewed to ascertain both how DIALOG searches were handled at each library and librarian reactions to the service. A profile of each library was then constructed based on the results of these interviews. These profiles are presented below. (Note: "Staff" in the following profiles refers only to those librarians who conducted DIALOG searches, unless specifically stated otherwise.)

San Jose Public Library

The San Jose Public Library consists of a large central library and 11 branches and serves a municipal area with a population of over 500,000. The San Jose Public Library is also the only library participating in the study which operates a municipal reference service staffed by a full-time professional librarian. The reference staff at the library consists of 22 full-time librarians, 7 part-time librarians and 4 library technical assistants. The majority of DIALOG searches completed during the first six months of the project were done by four reference staff members selected by the Coordinator of Adult Services.

Early in the project, San Jose's Staff began to complain about the large number of requests being submitted by students from San Jose State College and the consequent drain on staff time. Finally, in January, 1975, the library attempted to withdraw from the experiment. A request was submitted to the San Jose City Council explaining that recent staff cuts coupled with a high demand for on-line searches were imposing tremendous stress on the remaining staff members and were adversely affecting other library services. The San Jose City Council voted, however, against terminating the experiment, explaining that the program was providing a useful service to patrons and that this was an important aspect of the function of the library.

Subsequently, a San Jose State College graduate student in library science was assigned to assist library staff in performing searches. This individual received academic credit for conducting searches. In addition, she had some previous experience doing DIALOG searches at the Stanford Research Institute. This individual worked six hours a week, coming into the library for three hours on two separate days. By the end of the free period (May 31, 1975), at which time the student operator's employment at the library ended, she was doing almost all of the DIALOG searches.

During the pay period, responsibility for conducting DIALOG searches reverted to four members of the San Jose Library staff. Actually, three staff members conducted the majority of searches completed during the pay period. Of the four staff members originally assigned to conduct DIALOG searches, three continued to conduct searches throughout the entire two-year period. The fourth staff member, during the pay period did not begin conducting searches until November, 1975.

Throughout the project, DIALOG searches were done in the order in which they were submitted to the library. No priority was given to DIALOG questions at any time during either the free or pay periods.

During the free period almost 100% of DIALOG patrons at San Jose were "walk-in" patrons. Staff at San Jose specifically encouraged patrons to appear in person when requesting a DIALOG search. However, the majority of patrons did not talk directly with the actual searchers unless telephoned for some clarification of the search request. During the pay period, 75% of DIALOG requests were received by phone and only 25% of DIALOG patrons were "walk-in" patrons. All DIALOG requestors were asked to set up appointments with the DIALOG operator before searches were conducted.

None of the regular San Jose reference staff had had any previous experience with on-line searching prior to the beginning of Project DIALIB. Two of the original DIALOG operators received the introductory two-day training course given at Lockheed. All other staff members were taught initial search techniques by these two individuals.

All staff members stated that they found it easy to learn on-line searching, with the exception of one individual who found on-line searching very difficult to learn. All staff members felt that additional training was required, particularly to learn the idiosyncracies of each new data base being added and to learn more sophisticated search strategies and techniques.

With one exception, all staff also indicated that they felt 1-2 days were required to learn on-line searching initially. However, estimates on time required to become proficient varied widely and most staff agreed that proficiency depended on the volume of searches conducted and on the data base being searched.

During the free period, two of the staff estimated that they conducted 10-12 searches per month, two did about three searches per month, and the student operator completed about 25 searches per month. During the pay period, three staff members completed from 10-12 searches a month, while the remaining individual completed 1-2 searches per month.

Staff members who conducted the majority of the searches felt either proficient or extremely proficient at searching. Staff who conducted relatively few searches felt that they were not proficient. All staff also indicated that their proficiency varied widely between data bases. However, with one exception, all staff members found on-line searching extremely enjoyable.

During the free period, staff members felt that they did not have enough time to devote to DIALOG. Most felt that other reference work should come first. In addition, staff shortages made it necessary to decrease the amount of time allotted to DIALOG searches. Time was not a problem during the pay period. Because of the reduction in the number of searches, all staff felt that they had enough time to devote to DIALOG. Staff members did not feel that other reference services suffered because of the time devoted to DIALOG because at no time in the experiment did DIALOG work take priority over other reference duties.

Of the five staff members involved at different intervals throughout the experiment, three felt that provision of DIALOG service at no cost or at partial cost to patrons prohibits establishment of other services that might be offered through the library. They felt that library funds could best be allocated to staff and new materials (books, journals, etc.) as these basic library services were already inadequate.

At the end of the free period, all staff felt that provision of DIALOG service gave the library a more innovative and progressive image, primarily to city officials, library patrons and the local business and professional community. By the end of the second year, however, all staff felt no change in image had taken place except among actual DIALOG patrons. In particular, staff did not see improvement in liasons with city government agencies or officials as a result of the experiment.

During the first year, most staff members declined to comment on whether or not they felt DIALOG had had any effect on the type of patron using the reference service. By the end of the second year, staff all noted that graduate students and business professionals were prime users of DIALOG but that these individuals did not make use of other reference services in the library.

Those librarians who had conducted searches since the beginning of the project felt that their participation in the experiment had greatly expanded their knowledge and their "horizons". Most were excited about the opportunity to have "hands on" experience with new technology. Other staff felt that the major impact of the service was to increase the interaction between the librarian and the patron and to increase awareness of the need for good interviewing techniques and skills on the part of the librarian.

All DIALOG staff felt that a combination of user fees and the library budget should be used to support the service. With one exception, there was general agreement that the library should cover, at least, staff time and equipment. Furthermore, all staff felt that adequate DIALOG service could be provided through one terminal located in each county.

All staff stated that it was impossible to compare the types of questions being answered through DIALOG to normal reference questions handled manually. DIALOG questions were considered to be both more technical and more complex than reference questions usually handled by public librarians. For these reasons, no statements about the cost-effectiveness of on-line search methods as opposed to manual search methods could be made.

Staff did feel that the service had some impact on reference librarians not selected to do DIALOG searches. They stated that it was difficult for these individuals to judge whether or not a requestor's question should be answered using DIALOG. Patrons often became annoyed if they had to be referred to a DIALOG librarian when the individual they were dealing with could not answer questions concerning DIALOG service. In addition, non-DIALOG operators receiving inquiries about DIALOG often made statements and promises about the capabilities of the system or about the applicability of an on-line search for a particular type of question that were not true. This confusion resulted because of a lack of knowledge about the capabilities of DIALOG and the content of the data bases available through the system.

The major criticism of DIALOG concerned the need for in-depth information about each data base and the inadequacy of the manual in describing data base organization. This criticism intensified during the second year as the number of data bases available through DIALOG increased rapidly. Staff suggested that manuals be available for each data base explaining organization, optimal search strategies, etc.

During the pay period, the staff were extremely critical of Lockheed's failure to provide search costs on-line at the completion of a search. As a result, a substantial amount of staff time had to be devoted to determining search costs. (Note: Lockheed now provides on-line printout of search costs.)

Finally, half of the staff felt that DIALOG was a very useful reference tool for the public library, particularly with respect to bibliographic searches. The other half felt that DIALOG was not a useful tool for a public library and that such a service would be more appropriately provided through special libraries.

Santa Clara County Library

The Santa Clara County Library is a large system with 13 branches located throughout the county. The DIALOG terminal was located at the research library in Cupertino. The Cupertino library has a reference staff of eight persons. Five members of the reference staff were responsible for conducting searches at the beginning of the project, but two of these individuals conducted searches only during the first two months of the project. The other three staff members conducted searches throughout the free and pay periods.

Only one of the staff had ever done any on-line searching prior to Project DIALIB. That individual had some limited experience with DIALOG through the ERIC Clearinghouse at Stanford. Two of the original five librarians received the two-day training course from Lockheed. The other DIALOG operators received their training from these Lockheed-trained librarians.

During the free period, in spite of the large number of branches, almost all on-line service patrons were "walk-in" patrons. By the end of the pay period, 90% of on-line search requests came by phone, about 5% were received through branches, and another 5% came from county agencies or "walk-in" patrons. Staff did comment on the low number of on-line search requests referred through branch libraries. (Cupertino normally receives a large number of reference requests from branches.) Otherwise, the procedure for handling on-line search requests remained constant throughout the experiment. Patrons requesting on-line searches were referred directly to one of the DIALOG librarians. The librarian conducted an interview with the patron concerning the exact nature of the search request and arranged an appointment with the patron if that individual wished to be present at the time of the search.

During the free period, no more than three or four searches were scheduled for any one day. If the patron did not wish to be present, the search was performed whenever the searcher had time. Not all searches were performed by the same individual who had interviewed the patron. on-line service staff members discussed the results of the search with the patron whenever possible.

This procedure was refined during the pay period. Scheduling appointments with patrons was not a problem during the pay period because of the reduction in the number of search requests. At the time of the search, the DIALOG librarian discussed the search strategy with the patron, conducted the search, discussed search results with the patron, and computed the cost of the search. All patrons were billed immediately upon completion of the search, or were charged a $5.00 deposit with the remainder due at the time the search results were picked-up. No bills were sent to patrons.

The three staff members that conducted searches throughout the free period averaged about 20-25 searches per month. During the pay period, one staff member averaged 20 searches per month, another individual averaged 10 searches per month, and the third staff member averaged only one search per month.

Most staff members felt that initial training was not adequate and that additional training was required--particularly to learn more sophisticated searching techniques after the initial learning period. In addition, one staff member felt strongly that more hands-on experience with the terminal was required during the initial learning phase.

Two of the staff indicated that they found the system moderately easy to learn, while the third searcher felt that it was very difficult to learn the system. However, all searchers found on-line searching extremely enjoyable.

Staff members indicated that anywhere from one day to two weeks were required to learn the system initially and that some prior knowledge of set theory or computers would be extremely helpful. Staff felt that two to three months of heavy use were required to become proficient in on-line searching.

Staff estimates of searching proficiency varied widely. Most staff members felt moderately proficient at conducting on-line searches depending on which data base they were using. Staff members agreed that proficiency was related both to the number of searches conducted every month and to the particular data base being used. Searchers who felt proficient after a large number of searches during the free period, felt that decreased search volume during the pay period had reduced their proficiency.

All staff felt that they had sufficient time to devote to on-line searching because this activity took priority over other reference duties. However, these individuals also felt that the entire process associated with answering an on-line search question was extremely time-consuming, and that in many cases they did not have enough time to devote to other reference duties. This problem was particularly severe near the end of the free period as the search volume of searches being done increased substantially. During the pay period, staff felt that more time was available for other reference work, but that on-line search work still cut into other responsibilities. In-depth manual reference work was the major area that suffered from lack of time.

During the free period, staff also felt that other reference services normally provided were not receiving as much time as they had prior to the introduction of DIALOG into the reference department. Those services suffering from neglect included book selection, special out-reach programs, general reference work and young adult activities. During the pay period, this problem essentially disappeared as the reduction in volume of searches required less staff time. Staff did feel that provision of DIALOG service might prohibit the establishment of new reference activities in the future, depending both on the available library budget and on staff time.

Staff did feel that DIALOG expanded the reference service and attracted its own unique type of patron. They found more college students and more businesses using the reference service. These new patrons sometimes discovered other materials of interest to them when coming into the library to request an on-line search.

Staff members also felt that the provision of DIALOG service gave the library a more innovative and progresssive image, but only to the business community and to college students in the area who were the principal users of the services. Staff were very disappointed in the lack of response of city government agencies and officials to the service. Cupertino, particularly, attempted to encourage government agency use of on-line searching by providing demonstrations to agencies and by including in the library budget a set sum to cover free searches for agencies. However, agency response to this offer was extremely limited (about 20 searches). Staff did feel that the library should adopt more technological innovations such as BALLOTS, computerized card catalogs, and computerized ordering systems.

During the free period, all staff members felt that DIALOG had had a significant impact on their reference duties. They stated that they often spent up to one-half of their day working on DIALOG-related activities and that this cut down substantially on the time available to perform other reference duties. During the free period, the on-line search service also had a substantial impact on reference librarians not conducting computer searches. They were faced with increased workloads as they had to cover the duties normally performed by DIALOG librarians. By the second year, these problems were not as severe. The major complaint from all staff was the time required to calculate search costs after the search was completed.

Staff members differed on their statements as to how the service should be supported. Most felt that DIALOG should be supported by a combination of user fees and the library budget. One person felt that support for the service should be provided by either the business community or by county government. Staff also felt that one terminal per county would be sufficient to handle search requests.

None of the respondents felt that they could compare the cost-effectiveness of DIALOG with manual searches since the type of questions asked were entirely different. In fact, they stated that they have never done manual searches on questions like those asked of DIALOG.

The major criticism of DIALOG throughout the experiment was the need for some description of each new data base and the difficulty of learning the organization of each new data base without a training manual*. Several staff members also felt that training workshops should be conducted every six months.

During the pay period, all staff criticized the absence of on-line printout of search costs and complained about the time required to compute search costs manually.

All staff felt that on-line search services were useful and would probably become a regular service in the library in the future. However, they felt that provision of such a service would require additional staffing and possibly funding from a source outside the public library system.

Redwood City Public Library

The Redwood City Public Library consists of a main library and two small branches. When the DIALIB project first began, almost 100% of DIALOG patrons were "walk-in" patrons. By the end of the free period,

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* New data bases are often put on-line several months before the data base descriptions are available. This is done because many users familiar with the hard copy version of the data base are anxious for the on-line version.

80% were "walk-in" patrons and 20% of on-line search requests were being received by mail, principally from other branches. During the pay period, almost all search requests were initially received either by mail or by phone.

Redwood City has a reference staff of five individuals. Of the four Project DIALIB libraries, Redwood City had the largest turn-over of staff during the two year period. Although all staff members performed searches, only two of the original staff conducted searches throughout the free and pay periods. The other three staff members that started with the experiment all terminated their employment at the library at various times during the free period. These individuals were subsequently replaced by three new staff members who were also trained to conduct DIALOG searches.

During the free period, whenever possible, patrons requesting an on-line search were interviewed directly by the individual who later conducted the search. Redwood City maintains a policy of attempting to answer all reference questions, including on-line search questions, within one to two days. This procedure was altered somewhat during the pay period. In late March, 1976, patrons requesting a search were asked to make appointments to be present at the time the search was conducted. Throughout both years of the project, on-line searches took priority and staff normally dropped all other activities to assist the DIALOG user.

None of the staff had ever done any on-line searching before Project DIALIB. Two staff members received the Lockheed two-day training course. All other staff were trained initially by these two individuals. At some time during the project, most staff did attend a one-day workshop at Lockheed. Everyone felt that additional training was required, particularly as data bases were added to the system. All staff indicated that they found it moderately easy to learn the basics of on-line searching.

As indicated earlier, only two staff members conducted searches throughout the free and pay periods. Three staff members conducted searches only during the free period and three different staff members conducted searches only during the pay period. During the free period, each staff member averaged about 20 searches per month. During the first three months of the pay period, two staff members completed all searches, averaging from 3-4 searches per month. During the remaining nine months of the pay period, the five staff members averaged from 7-10 searches each per month.

All staff felt they were moderately proficient at conducting searches, but stated that proficiency was dependent on familiarity with the data base being searched. During the free period, staff varied widely in the extent to which they enjoyed searching. Some individuals stated that searching was often exhausting (due to the large number of searches done per month during the free period) and that sometimes the patron's attitude influenced the attitude of the staff towards conducting a search. All staff, during the pay period, found on-line searching at least moderately enjoyable.

All staff also found computer searching extremely time-consuming, but felt that because of the priority placed on the service they were given enough time to devote to computer searches. However, other reference tasks did suffer somewhat throughout the experiment. In particular, staff found themselves somewhat unwilling to do in-depth research on reference questions that were not to be done on DIALOG.

Basically, however, provision of the service was not considered to have subtracted from other services provided prior to the beginning of Project DIALIB (with the one exception of book selection). Staff did feel though that provision of the service prohibited the establishment of other services that might be offered through the library, as there was no staff time available to plan new services.

During the first year, all staff felt that provision of DIALOG service gave the public library a more innovative and progressive image, primarily to the general public and local businesses. These impressions were modified during the pay period. Staff saw little change in the public library image except among college students and businesses actually using the service. They were particularly disappointed in the reaction of city government officials during the second year, who were totally unconcerned about the termination of DIALOG service at Redwood City Public Library. Still, staff felt that the library should adopt more technological innovations, although they had nothing specific in mind.

Staff were divided on their answers to a question asking if they felt DIALOG had had any effect on the type of patron using the reference service. One individual answered that patrons had not changed. Other staff members replied that they had noticed a change but were unwilling to attribute this change specifically to the availability of DIALOG service. These staff members felt that they were answering a much higher and more complicated level of question than they answered five or six years earlier, but they felt that this could be partly attributed to a general improvement in the reference service during that period.

College students and businesses were considered to be the principal users of the service. In addition, however, three organizations maintained accounts at Redwood City to cover searches requested by their personnel. These three organizations accounted for 39 searches completed during the pay period. Staff at Redwood City also complained about the fact that most DIALOG patrons came from outside the library's "service area."

Most staff members felt that one effect of DIALOG on their role as a reference librarian was to increase awareness of additional information services and to make them more aware of new trends in science and technology. The major impact of the service was to increase the interaction between the reference librarian and the patron. All staff doing DIALOG searches found it necessary to improve their in-depth interviewing skills and generally found this to be a positive benefit of the project.

Staff found it impossible to rate the cost-effectiveness of DIALOG searches as compared with manual searches. In all instances, they felt that they could not have answered the type of questions being asked without the use of DIALOG and that patrons would have been turned away if the service had not been in operation.

Most staff felt that ideally the service should be supported entirely by the library budget but that realistically a combination of user fees and the library budget would be necessary. Again, some of the problems in determining how to charge for the service related to concerns about the current use of the system by a relatively "elitist class" and by patrons from outside the library's service area. The majority of staff also felt that one terminal per county could provide adequate service to the user population.

Staff did feel that patrons needed to be educated about what on-line search service offers and how DIALOG works. They also felt that an ignorance about system capabilities extended to intermediaries (most commonly branch librarians) who deal with initial inquiries from DIALOG patrons. Staff felt that effective DIALOG service and subsequent user-satisfaction could be greatly improved by providing more information about DIALOG. In addition, there was a general feeling that service suffered because of the staffing problem. It was suggested that the service required one person who could really operate DIALOG well. The problem of rotating shifts, however, made it impossible to assign responsibility for DIALOG to only one person.

The major criticism of DIALOG thoughout the project concerned both the organization of the data bases* and the lack of instructional information available on how to use these data bases. All staff found the training manual inadequate in explaining the various idiosyncracies and the organization of different data bases and expressed the hope that data bases could be standardized. Staff found it extremely difficult to know all data bases equally well, and found themselves using those data bases with which they were most familiar even when a less familiar data base might have been more appropriate. Training on each new data base added to the system was seen as a real necessity. In the absence of this training, staff used demonstration time to familiarize themselves with new data bases. But even this time became inadequate as the number of data bases being added to the system continued to increase rapidly. Staff felt quite strongly that patrons should not be penalized, in terms of search cost, for the time spent by the reference librarian learning a new data base.

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* Data bases are identical to the hard copy reference versions with all their idiosyncrasies. Thus, if one is not familiar with the hard copy versions, the lack of consistency of terminology can be confusing.

San Mateo County Library

The San Mateo County Library is also a large system with 14 branches located throughout the county. DIALOG service was provided through the San Mateo County Library Headquarters located in Belmont. Unlike the other libraries participating in Project DIALIB, the majority of on-line patrons at San Mateo were not "walk-in" patrons. During the free period, nearly 75% of DIALOG requests were submitted to branch libraries and forwarded to San Mateo County Library. "Walk-in" patrons represented only about 25% of the total DIALOG users. During the pay period, walk-in patrons and requests forwarded through branch libraries each represented 50% of all requests.

At the time Project DIALIB began, San Mateo County Library had a total of three full-time reference librarians and one reference supervisor. All four of these individuals did on-line searches during the first year although the three reference librarians handled the bulk of the searches. One of the original reference librarians conducted searches for only nine months during the free period, before being transferred out of the reference department. During the pay period, two new reference librarians were assigned to DIALOG. Thus, during the second year, the equivalent of four and one-half staff persons were responsible for conducting DIALOG searches. San Mateo did have one additional individual, from the Public Health and Welfare Agency in the county, conducting searches. This person did all on-line searches requested by that agency, as the agency submitted a large number of requests.

All on-line requests received at San Mateo were placed with other reference questions and completed when the reference librarians had time, unless a deadline was specified on the request form. DIALOG searches were not given priority at any time during the experiment. Because most on-line requests were submitted through branches during the first year, patrons were generally interviewed by branch librarians who were unfamiliar with on-line searching. Requests were then forwarded to the main library and search results were generally sent back to the branch library. Patrons then received search results from the branch librarians. Staff felt that during the second year, branches were more likely to send patrons to the Belmont facility than to forward requests. They attributed the reluctance of branch librarians to handle on-line search questions to a general lack of knowledge about DIALOG capabilities and subject content. "Walk-in" patrons at San Mateo were generally interviewed by the librarian who ultimately conducted the search.

None of the San Mateo reference staff had had any previous experience with an on-line search service. With one exception, DIALOG operators found it moderately to very difficult to learn on-line searching and all felt that adequate training had not been provided. Only the bare essentials of searching were learned initially and everyone felt that additional training was required in order to learn more sophisticated searching techniques and the organization of new data bases. The need for user-oriented manuals on all data bases was emphasized strongly.

DIALOG staff indicated that anywhere from two days to three months were required to learn on-line searching initially, depending on the number of searches completed. Most staff found that estimates of proficiency depended both on the number of searches conducted and the familiarity with the data base.

During the free period, with the exception of the DIALOG operator from the Public Health and Welfare Agency, all staff averaged about 10-15 searches per month. The Public Health and Welfare Agency librarian completed 30-40 searches during the free period. During the pay period, each staff member averaged from 1-3 searches per month.

All DIALOG searchers felt that they were moderately proficient at conducting on-line searches, depending on the data base being used. However, only three of the staff found on-line searching enjoyable. Other staff members either did not enjoy on-line searching or enjoyed it only when comfortable with the data base being searched.

Regular San Mateo staff stated that they found conducting on-line searches moderately time-consuming. Due to the request load during the free period, no one felt that they had sufficient time to devote to on-line searching. Staff also felt that they did not have enough time to devote to reference duties not connected with the on-line search service, partly because the library was considered to be understaffed even before DIALOG service was initiated. They also felt that the time they spent on on-line searches detracted from other reference services which were provided prior to the beginning of the project. However, staff felt that provision of DIALOG service would not necessarily detract from other services as long as sufficient staff time were available, and, in fact, during the pay period, only two of the DIALOG operators complained about the time devoted to DIALOG. Staff also felt that the establishment of future services would not be prohibited because of on-line searching.

During the free period most staff felt that provision of an on-line search service gave the library a more innovative and progressive image, particularly to the general public and to the "educated public who look down their noses at the public library". However, by the end of the second year, staff felt that only actual DIALOG users had any altered perceptions about public libraries. They felt that the service was not well enough known in the community to alter the image of the library as a "recreational reading" center. However, all staff felt that the library should continue to adopt more technological innovations, although they did not state what these might be.

DIALOG staff also felt that provision of the service had altered the type of patron using the reference service, particularly by bringing in more professionals, college students, and technically-oriented individuals. Staff did feel that they were getting quite a few Stanford students during the pay period, in spite of the fact that on-line services were available at Stanford as of April 1, 1976. The Stanford service did not differ substantially from that offered through the San Mateo County Library except for the additional charge of a $2.00 administrative fee. Staff attributed most of the Stanford use to word-of-mouth publicity by two Stanford students who used the service during the free period.

During the free period, staff felt that provision of the service had altered the way in which reference questions were analyzed, as the librarians had to decide whether or not the question should be done on DIALOG. Also, the librarians felt that they became more involved in the patron's question as a result of attempting to define search terms and search strategies.

During the pay period, however, staff stated that the principal impact of DIALOG had been to "broaden the horizons" of participating staff, to increase their awareness of certain subject areas and data bases, and to familiiarize staff with new technology.

With the exception of one individual who felt that the service should be totally supported by the user, all staff suggested that some combination of user fees and the library budget should be used to support the service. In addition, most staff members felt that one terminal per county could provide adequate service. One individual stated, however, that the problems of distance and staff time would make four terminals more realistic and effective.

Staff did not think that comparisons could be drawn between questions being answered through DIALOG and "normal" reference questions received by the library. They stated that the library did not routinely answer such highly technical questions. Staff did feel, however, that DIALOG would be extremely cost-effective compared to manual search methods.

The major criticisms of DIALOG during the first year concerned the down time and the slow response time. During the pay period, all staff emphasized the need for user-oriented manuals for each data base describing content, organization, and optimal search strategies. The lack of data base standardization was seen as a major problem. The second major criticism during the pay period was the lack of on-line printouts of search costs.

DIALOG staff did feel that the on-line search service was extremely valuable, particularly as a back-up tool for regular subject searches and for bibliographic searching. They also stated that they would like to see it continued in the future. As one staff member stated, "a lot of people to whom such a service is valuable have no other access--and such a service is very much in keeping with the purpose of the public library."

DIFFERENCES BETWEEN PROJECT DIALIB LIBRARIES - FREE PERIOD

Some of the differences that have appeared between the libraries can be explained after looking at these brief profiles.

Time to Receive Search Results

First, the time that elapsed before the patron received the results of a DIALOG search can be accounted for in part by three factors; percentage of "walk-in" patrons, priority given to DIALOG searches, and staff time spent on DIALOG searches.

1. San Mateo had the lowest percentage of "walk-in" patrons. Instead, the majority of their search requests were received through branch libraries. This created additional delays in getting the search results to the patron because of the time required to mail the search request to the main library and then for the main library to mail the results of the search back to the branch library.
2. At both San Mateo and San Jose, DIALOG searches were not given priority as they were at Santa Clara and Redwood City. DIALOG questions were thus done along with all other reference questions whenever the librarians had time for them.

3. In addition to the delays caused by the lack of priority given to on-line questions, San Jose had a student operator who worked only two days per week. This operator also conducted the majority of searches done at San Jose during the last few months of the free period. Therefore, most on-line searches had to wait until she was available to do them.

Number of Searches

The number of searches done at all libraries appears to be partly dependent on the time which elapses before the patron receives the search results, the attitude of the staff conducting searches towards the service, the location of the library, and the visibility of the terminal.

1. The longer lag time between submission of the search request and receipt of the search results which patrons encountered at San Mateo and San Jose may have influenced the number of search requests submitted to these libraries. Patrons wanting searches done quickly often went to Redwood City or Santa Clara when informed of the length of time they would have to wait for results at the other two libraries.

2. The disproportionately large number of searches done at Redwood City was partly dependent on the attitude of the staff at that library towards the service. The head reference librarian at Redwood City during the first year of the project was particularly enthusiastic about DIALOG. She participated actively in promoting the service, encouraged her staff to conduct searches, and conducted more searches per month (from 30-40) than any other reference librarian participating in the project. She pushed the service constantly and much of her enthusiasm was transmitted to other DIALOG staff at Redwood City.
3. The rather isolated location of the San Mateo County Library, and the subsequent low percentage of "walk-in" patrons requesting DIALOG searches, is one of the factors contributing to the low number of searches done at that library. Because most requests were submitted through branches, many patrons also did not actually see the DIALOG terminal or a DIALOG demonstration.
4. In contrast, the prominent location of the terminal at Redwood City seems to have been responsible for a large number of search requests. These requests were often made by patrons interested in the

technology or interested in either the operation or capabilities of the system. Such patrons often submitted questions out of curiosity rather than out of any real reference need.

The variation in the number of searches performed at the four libraries cannot be explained by any difference in the number of reference staff conducting searches at each library. This number, ranging from three to four librarians, remained fairly constant between libraries. In fact, the two libraries who did the least number of searches (San Jose and San Mateo) were also the only libraries who had some additional help from outside staff (a graduate student and a county agency librarian, respectively) in conducting searches. San Jose actually had the largest number of reference librarians capable of conducting searches.

Search Time and Citations Printed

Differences in search time and citations printed are less easy to explain. Santa Clara printed far more on-line citations than any of the other libraries, which accounts partly for the higher average search time at Santa Clara. However, Santa Clara also printed far more off-line citations per search than any of the other libraries. The subject of the question being asked and the presence of the patron at the time of the search may be the principal factors affecting

Santa Clara's higher average search time and total number of citations printed.

1. Santa Clara had a much larger percentage of technical professionals using the service than any of the other libraries. DIALOG data bases have much more material relevant to the types of questions these users could be expected to ask (especially as a large percentage of the questions were asked as part of the patron's job) than to any other subject. This may account then for the large number of citations printed.

2. In addition, more than 50% of the patrons at Santa Clara were present at the time of their search. The patron's presence would contribute to the longer search time as the librarian would be involved in redefining search terms and strategies with the patron, and in explaining system operation as the search progressed. Furthermore, the patron's presence would probably also have an effect on the number of citations located and subsequently printed. The patron and the librarian working together would probably locate more relevant material than either would working alone. Also, the patron might discover new topics of interest as

the search progresses that would increase the amount of material located.

There is no obvious explanation for the low search time and low number of citations printed at San Mateo. It is possible that pressures on staff time prohibited the DIALOG librarians from spending much time at the terminal.

Search Value

The low search time and lower number of citations printed at San Mateo may, however, partly explain the difference in the values of DIALOG searches as rated by patrons. It can be seen from Table 13 that slightly fewer patrons at San Mateo felt that their question was answered adequately than did patrons at the other participating libraries. Thus, it would appear that staff at San Mateo, for a number of possible reasons, did not devote enough time to DIALOG searches to provide adequate answers to patron questions. This, in turn, might have affected the value of the search to the patron.

The difference in search value to patron cannot be explained by the length of time it took the patron to receive the search results. As mentioned previously, San Jose and San Mateo were comparable in this respect, yet patrons at San Jose rated the value of their searches somewhat higher than did San Mateo patrons. However, it should be noted that differences in patron satisfaction might depend on the subject of the question being submitted and the applicability of the information contained in the data bases to this subject area. It is therefore possible that San Mateo received a higher percentage of questions dealing with subjects which were not adequately covered in the data bases. There do not appear to be any indications that this occurred, but the available data do not permit any clarification of this point.

Patron Occupations

The high percentage of technical professionals that had searches done at Santa Clara is probably due in part to the location of the library. Santa Clara is situated near a large number of major industries (including electronic, aerospace and computer industries) located just outside of the city of San Jose. The Santa Clara County Library is probably the library most accessible to professionals working in these industries.

Publicity

Finally, the higher percentage of patrons at San Jose who heard about the service through a college library is directly related to the fact that a large number of students from San Jose State submitted DIALOG requests. Early complaints from the San Jose DIALOG librarians about heavy use of the system by these students may also partly explain why a much lower percentage of patrons heard about the availability of the service through the librarian than at any other library. The feeling of the staff at San Jose that DIALOG was a tremendous drain on their time may have contributed to a reluctance on the part of the librarians to further publicize the service.

DIFFERENCES BETWEEN PROJECT DIALIB LIBRARIES - PAY PERIOD

As in the previous section, library profiles are used to suggest reasons for differences which appeared between libraries during the pay period. Again, the lack of control makes it impossible to verify any apparent cause and effect relationships. All explanations for differences are based on subjective judgments and are presented principally as indicators for future research. (No reasons are postulated for interlibrary differences observed in patron occupations and publicity sources as these did not differ substantially from the free period.)

Time to Receive Search Results

First, the time that elapsed before the patron received the results of a DIALOG search can be accounted for in part by two of the same three factors operating during the free period; percentage of "walk-in" patrons versus percentage of requests forwarded through branch libraries and priority given to DIALOG searches.

As indicated earlier, San Jose and Santa Clara provided from 80-90% of their patrons with search results in less than one week. Redwood City provided about 70% of their patrons with search results in one week or less. At San Mateo, however, almost 50% of DIALOG patrons did not receive the results of their searches until one to six weeks after the request was submitted. Possible reasons for these differences are as follows:

1. At three of the libraries, 75-90% of all search requests were

submitted directly to the library providing DIALOG service. (Most of these requests were initially made by phone. Patrons were then encouraged to make an appointment to be present at the time of the search.) However, at the San Mateo County Library, 50% of the search requests were received through branch libraries and 50% came from "walk-in" patrons. As during the free period, the large percentage of requests received through branch libraries were subject to delays that did not apply to search requests made directly to the library providing DIALOG service. Such delays were primarily due to the time required both to mail requests to the main library and for the main library to mail the results of the search back to the branch library.

Comparable delays were experienced for some patrons at Redwood City. The Redwood City Library received about 40 search requests by mail from three organizations located at considerable distances from the library (Monterey, Stanislaus, and San Francisco). The time required to mail requests and results may account for the slightly lower percentage of patrons indicating receipt of search results in less than one week at Redwood City than at Santa Clara or San Jose.

2. At both San Mateo and San Jose, DIALOG searches were not given priority as they were at Santa Clara and Redwood City. Instead, DIALOG questions at San Mateo were done along with all other reference questions whenever the librarian had time for them. At San Jose, while DIALOG searches were not officially given priority, searches were done at the time of appointments made with the requestor. Thus, the actual priority given to a DIALOG search was heavily dependent on appointment scheduling.

Number of Searches

The most noticeable difference in this category is the comparatively lower number of searches completed at San Mateo than at all other libraries. Again, the location of the library and the visibility of the terminal seem to have adversely affected the number of search requests received by San Mateo.

1. As during the free period, the isolated location of the San Mateo County Library and the relatively large percentage of search requests received through branch libraries seem to be the major reasons for the low number of searches done at that library. Furthermore, staff at the San Mateo County Library felt that many branch librarians were extremely reluctant to handle DIALOG requests because they did not really understand exactly what the service offered. As a result, many branch librarians sent patrons with DIALOG requests directly to the main facility.

2. The comparatively large number of searches completed at San Jose is probably primarily due to the proximity of San Jose State College. Throughout the experiment, students from San Jose State were a consistent user group.

3. The total number of searches completed at Santa Clara is somewhat lower than at San Jose and Redwood City. While this is not a startling difference, it can partly be explained by the fact that Santa Clara County employees were on strike for one month right at the beginning of the pay period. No searches were completed at Santa Clara during that strike.

Search Time and Citations Printed

Interlibrary differences in search time and citations printed are not easy to explain with available data.

1. San Mateo librarians printed far more citations on-line than other librarians, which accounts partly for the higher average search time at that library. However, the subject of the search may also have contributed to the comparatively higher search times at San Mateo.

2. The higher search time at San Mateo may also be partly due to the fact that librarians at that facility conducted only 2-3 searches on the average per month. At all other libraries, staff averaged about 10 searches per month. In addition to familiarity with a particular data base, staff seemed to feel that proficiency was strongly related to the number of searches completed every month. The low number of searches completed at San Mateo might have affected the ability of the staff to maintain their proficiency with the system.

3. The large number of citations printed per search at Santa Clara might again be caused by the patron's presence at the time of the search. Although three of the libraries specifically requested patrons to make appointments to be present at the time of the search, Santa Clara had by far the largest percentage of patrons who actually were present. Explanations offered for a comparable difference observed during the free period are equally applicable to the pay period.

4. Santa Clara also continued to have a much higher percentage of

business and technical professionals conducting searches as part of their job. DIALOG data bases currently have much more information relevant to the types of questions these users might be expected to ask than to other subject areas. As during the free period, this may account for the large number of citations printed per search.

There are no obvious explanations for the low search time and the low number of citations printed per search at San Jose.

Search Value

Interlibrary differences in patron estimates of search value correspond closely to whether or not the patron felt that the results of the DIALOG search provided sufficient references to answer their questions adequately (note: both variables are based on a very small user sample). For instance, San Mateo had both the highest percentage of patrons stating that their searches were of major value and the highest percentage of patron's stating that the DIALOG search provided sufficient references to answer their question adequately.

It should also be noted that differences in patron estimates of search value might also depend on the question topic area and on the applicability of the information contained in the data bases to this area.

And finally, the value of a search to a patron might depend heavily on the reason the patron requested the search. For instance, many graduate students request on-line searches as a preliminary step in choosing a dissertation or thesis topic. In such cases, students are hoping to find that very little work has been done on a specific topic. Thus, they find a search to be of major value when very few references are located. In contrast to graduate students, business and technical professionals seem to be more interested in locating all material relevant to particular problems and find searches of less value if such information does not exist or is not available.

VI. CONCLUSIONS

One of the principal purposes of the evaluation conducted by Applied Communication Research, as stated in Chapter II, was to provide public library administrators with data which would allow them to make decisions about the utility of providing an on-line search service through the public library and to determine what the cost of such a service would be. The data in Chapter IV were thus presented with the objective of providing administrators with the kind of information that would be useful in planning for an on-line service under two different funding situations. No attempt will be made to summarize such specific data on users, usage patterns and search costs in this section.

Instead, this section contains general conclusions suggested by the evaluation data and a number of pertinent observations derived from the entire Project DIALIB experience. It should be noted that most of the following points are subjective judgments based on a combination of observation, "hard" data, and extensive interviews with project participants. Apparent causal relationships cannot be verified using data obtained in a highly uncontrolled, case study approach. Although most observations cannot be verified, they are still important both as indicators of factors which may affect the success or failure of an on-line search service offered within a public library context and as indicators for future research.

1. The public library can be an effective channel through which to provide an on-line service. (Which is not to say that public libraries are the most effective channel--the data cannot support such speculation.) Project DIALIB libraries averaged 90 searches per month during the free period and 28 searches per month during the pay period. Also, about 70% of on-line service patrons during both periods felt that the results of their search were of considerable or major value.

2. Public libraries are not all equally well suited to provide on-line search services. At this time, on-line services are useful mainly to a small segment of the general population. The principal users are primarily educationally-sophisticated professionals. Thus, areas with a high concentration of individuals falling into the principal user categories provide the best "markets" for on-line services. Public libraries serving such areas would certainly find more demand for an on-line service than would public libraries located in areas with a low percentage of individuals in the principal user categories.

The most effective service (in terms of high volume and rapid turnover) seems to be provided through those main libraries that are easily accessible and that have a high potential for direct contact (either by phone or through "walk-in" trade) with patrons requesting on-line searches. In contrast, a library which is not easily accessible, which has little direct contact with patrons, and which would probably receive the majority of on-line search requests via branch libraries, appears to be less effective.

3. A public library interested in operating an on-line service

should be aware of alternative sources for on-line services which may be available in the area. If adequate services already exist to supply the information needs of user groups, the public library may not wish to enter into "competition" with such services.

4. If an on-line service is readily available, a market does exist for the service. The data indicate that on-line system patrons are not frequent users of the public library reference service. Instead, they are highly educated professionals and students from a number of varied disciplines. Such individuals do not normally consider the reference service at a public library a technical information source.

The majority of questions asked by these on-line service patrons are highly technical and complex. Reference librarians at the public libraries participating in Project DIALIB indicated that they would not be able to answer such questions without the assistance of an on-line service.

5. The initial provision of free searches to patrons, along with an active publicity campaign, seems to have had a strong impact on search volume. The four Project DIALIB libraries completed nearly 1,000 free searches during the first six months of operation. In contrast, libraries providing full-cost service to patrons (see Appendix D) without an initial free period or attendant publicity campaign indicate a relatively low volume of search requests. The available data do not allow a determination of the relative importance of these variables (free search period, publicity campaign) either individually or in combination.

6. The allocation of reference service staff time is one of the most important factors to be considered in planning an on-line search service. As stated in Chapter IV, available research indicates that most public librarians do not normally perform in-depth reference searching on the types of technical questions submitted by on-line service patrons. In such cases, computer searching and related tasks are too time-consuming to be simply added-on to a public librarian's reference duties. If such a service is added without proper allocation of reference staff time, other reference duties and/or services may suffer from neglect. In addition, if insufficient reference staff time is available for an on-line service, search volume and turnaround time can be adversely affected. Overworked staff are also more likely to be hostile towards the introduction and subsequent operation of a new service.

7. To maintain search proficiency, on-line searchers must complete some "critical mass" of searches each month in each data base for which proficiency is desired. (It is not possible to determine optimal upper and lower limits on this critical mass from the available data.) Project DIALIB searchers who completed relatively few searches in one month felt less competent at on-line searching than did more prolific searchers. They felt that "hands-on" experience was required to maintain familiarity with data base organization, optimal search strategies, and data base content. On the other hand, a librarian responsible for a large number of searches in one month may find that time limitations imposed at all stages of the search process (including query negotiation, on-line search time, and relaying of citations to the patron) may affect search quality.

8. The problem of maintaining familiarity with all data bases is one of the most difficult problems faced by reference librarians conducting on-line searches. Project DIALIB librarians, who assumed responsibility for conducting searches in all data bases, felt generally that their search competence increased with data base familiarity. The proliferation of data bases makes it extremely difficult for one person to maintain a thorough knowledge of each new data base. Project DIALIB librarians felt that the fact that many data bases have a relatively unique organization and content significantly compounds the problem.

There are two possible approaches which may help to alleviate this problem. An organizational approach would be to make each reference librarian responsible for maintaining expertise on a limited number of data bases rather than trying to cope with all of them. Project DIALIB librarians did not use this approach because reference librarians work in shifts (an "expert" in a particular data base might not be on duty when needed for a particular search) and particular "experts" would be unavailable while on vacation. A training approach would be to develop better instructional materials describing the organization, content, relevant keywords, and optimal search strategies for each data base. The absence of such instructional materials was one of the most persistent complaints expressed by Project DIALIB librarians.

9. The amount and quality of general training in on-line system operation may also affect the successful operation of the service. In the absence of experimental controls, it is impossible to determine the relative importance of this factor. However, most searchers believed that the initial training

sessions alone were not sufficient for optimal system utilization. They felt that either additional training sessions were required after searchers gained familiarity with system operation or that training manuals should be made available to assist searchers as they gain expertise. Almost all staff felt that better searcher-oriented instructional materials for DIALOG should be developed.

10. The attitude of the head reference librarian towards the service seems to have had a substantial impact on the speed and efficiency with which searches were completed. Librarians at all libraries found that provision of an on-line search service imposed additional demands on their time. However, at those libraries at which head reference librarians had a strong positive attitude towards the service, more searches were completed and were done in less time than at libraries where this attitude was missing.

11. The major effect of the shift from a free to a fee-based service was a reduction in the volume of search requests. (Current trends indicate, however, a steady increase in search volume during the pay period.)

Some shift was also observed in the allocation of staff time to various steps in the search process. During the pay period, staff attempted to reduce connect time (and subsequently the cost of the search to the patron) by spending more time off-line preparing for the search.

12. Finally, the provision of an on-line search service has done little in the short-term to alter the image of the public library in the community it serves. The principal impact of the service has been on professionals in

both business and industry and on college students, all of whom have been particularly impressed by this new service being offered through the public library. These users seem to view the public library as being more innovative and progressive than they had considered it to be prior to the implementation of the on-line service.

Municipal government officials have taken only cursory notice of the public libraries providing on-line search services. In spite of considerable effort on the part of DIALIB librarians to provide government agencies with demonstrations and/or free searches (even during the pay period), few such agencies actually made use of the service. However, some government agencies did make use of the service and at least one government official did note that a public library might be capable of providing support reference services for government agencies.

The process of changing an image or increasing public awareness of the role or function of the public library is a long, slow process. It is certainly much too soon to suggest what the long-range impact of an on-line service might be on either the public library or the community.

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APPENDIX A

DATA COLLECTION FORMS

FORM 1

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   *           Lockheed Retrieval Services           *
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   *                                                 *
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                Title        MORAL DEV
                Date/File    11-3-75/1
                Searcher     KS
                Requestor    R DESTFANO
                Address      TC
User 114   Date:11/03/75   Time:06:09:18   File: 1

             Search History                         Print Summary
Set Items Description                      No. File Accn/Set Fmt   Item-range
  1   216 MORAL DEVELOPMENT/DE,ID           1    1       6    5      1-31
  2  4427 ELEMENTARY SCHOOL STUDENTS/DE,ID
  3    40 ANIMALS/DE,ID,TI
  4   146 ANIMAL BEHAVIOR/DE,ID
  5     0 1*2*(3+4)
  6    31 1*2-5

 Command Use    Time Command Use    Time Command Use    Time Command Use    Time
 BEGIN     1     .02 MAIL      0     .00 /          0    .00 ORDER     0     .00
 EXPAND    0     .00 SELECT    4     .09 COMBINE    2    .04 LIMIT     0     .00
 LIMITALL  0     .00 KEEP      0     .00 DISPLAY    0    .00 ITEM      0     .00
 SETHIST   0     .00 TYPE      0     .00 PRINT      1    .01 END       1     .01
 PAGE      0     .00 MESSAGE   0     .00 EXPLAIN    0    .00 KILL      0     .00
 SORT      0     .00 ACTIVITY  0     .00 COMMENT    0    .00 RECALL    0     .00
 EXECUTE   0     .00 RELEASE   0     .00 STAT       0    .00 PUNCH     0     .00
 FILE      0     .00 INTERSC   0     .00 ./         0    .00 ERROR     0     .00
 Exec time       .17 Srch time      3.41 Print count     31 IP Acc.:          4
 Docs.:            0 Descs.:           4
```

FORM 2
DIALOG EVALUATION

Deadline__________

Search Request No.__________

Originating Branch__________

Originating Librarian__________

This library is participating in a study, sponsored by the National Science Foundation, of public use of online retrieval terminals in public libraries.

To determine the usefulness of the DIALOG system, both to the librarian and to library patrons, we would appreciate it if you would provide us with the information requested on this form. All information will remain confidential and will be used only for evaluation purposes. For a successful evaluation, it is important to have access to as many patrons as possible. However, we understand that some users may prefer to remain anonymous. If you do not wish to have your name used, please check the box at the bottom of the page and the librarian will block out your name before releasing this form to the evaluation consultants.

Thank you for your cooperation in making this a successful study.

NAME__________ DATE__________

HOME PHONE__________ BUSINESS PHONE__________

HOME ADDRESS__________

BUSINESS ADDRESS__________

OCCUPATION__________ LEVEL OF EDUCATION__________

1. Search Topic - Please record, in your own words, a full description of the subject on which you are seeking information. Be as specific as possible.

2. Depth of Search - Are you looking for (check one):
   - _____All possible relevant citations.
   - _____A few relevant citations only

3. Information Files - Please check those information files that you feel would be most helpful in locating information on your search topic:

_____ERIC	_____PANDEX	_____INSPEC	_____Other(specify)_____
_____Psych. Abs.	_____NAL/CAIN	_____Chem. Abs.	_____Don't Know (need librarian's advice)
_____Soc. Sci. Cit.	_____NTIS	_____Eng. Index	

I do not wish to have my name released. ☐

4. Reason for Search (check one):

_____Job _____Research Paper _____Personal Interest

_____School Assignment _____Other(please specify)______________________

5. Was search requested by (check one):
_____Librarian _____Client

6. How did you hear about the availability of DIALOG service?

_____Librarian _____Mailed notice _____Friend(Name)_________________.

_____Notice in library _____Newspaper _____Other(please specify)_________

7. To aid in this evaluation, would you be willing to be contacted to provide some brief follow-up information on your satisfaction with the results of your search (check one)? _____Yes _____No

Thank you for your assistance.

SEARCH DATA - To be filled out by person conducting search.

---

1. Person Conducting Search____

2. Date__________________Logon Time______________Logoff Time_______________________
(If more than one search was done at this time, please also indicate start and finish times for each search.)____

3. Off-line Search Preparation Time____

4. Information Files Used in Search: (Check all data bases used)
(Please place an asterisk next to any data base which was searched but did not provide citations.)

_____ERIC _____PANDEX _____INSPEC _____NTIS

_____Psych. Abs. _____NAL/CAIN _____Chem. Abs.

_____Soc. Sci. Cit. _____Eng. Index _____Other(specify)_______

5. Person Doing Search: (check one)

_____Librarian _____Client(alone) _____Client(with librarian assistance)

6. Client Availability: (check one)

_____Client present at time of search

_____Client available by phone at time of search

_____Client not available at time of search

7. Were the search results: (check one)

_____Picked up at main library _____Picked up at branch library _____Mailed to client

8. Comments:____

____

____

____

____

FORM 3

DIALOG EVALUATION

Deadline____________ Search Request No.____________

Originating Branch____________ Originating Librarian_________

This library is participating in a study, sponsored by the National Science Foundation, of public use of online retrieval terminals in public libraries.

To determine the usefulness of the DIALOG system, both to the librarian and to library patrons, we would appreciate it if you would provide us with the information requested on this form. All information will remain confidential and will be used only for evaluation purposes. For a successful evaluation, it is important to have access to as many patrons as possible. However, we understand that some users may prefer to remain anonymous. If you do not wish to have your name used, please check the box at the bottom of the page and the librarian will block out your name before releasing this form to the evaluation consultants.

Thank you for your cooperation in making this a successful study.

NAME______________________ DATE______________________

HOME PHONE______________________ BUSINESS PHONE______________________

HOME ADDRESS____

BUSINESS ADDRESS____

OCCUPATION______________________ LEVEL OF EDUCATION______________________

1. Search Topic - Please record, in your own words, a full description of the subject on which you are seeking information. Be as specific as possible.

2. List important terms (words and phrases) and any synonyms or related terms that you wish to include or exclude. Include both scientific and common terms. Please feel free to explain terms and to be as detailed as necessary.

TERM	SYNONYMS	EXCLUDED USES

3. List names of any people that you know to be publishing work relevant to your question.

4. English language only? Yes____ No____ Other languages:______________________

5. Depth of Search - Are you looking for (check one):

____All possible relevant citations.

____A few relevant citations only

I do not wish to have my name released. ☐

FORM 3 (continued)

6. Information Files - Please check those information files that you feel would be most helpful in locating information on your search topic. Also, PLEASE WRITE NEXT TO THE FILES CHECKED THE MAXIMUM YEAR TO GO BACK TO FOR THE SEARCH:

___ERIC ___ABI ___INSPEC ___NAL/CAIN ___AIM/ARM

___Psych. Abs. ___Chem. Abs. ___Eng. Index ___Bio. Abs. ___NTIS

___Soc. Sci. Cit. ___COMPENDIX ___CMA/EMA ___Other(specify)_______

7. Reason for Search (check one):

_____Job _____Research Paper _____Personal Interest

_____School Assignment _____Other(please specify)____________________

8. Was search requested by (check one):

_____Librarian _____Client

9. How did you hear about the availability of DIALOG service?

_____Librarian _____Mailed notice _____Friend(Name)________________

_____Notice in library _____Newspaper _____Other(please specify)________

10. To aid in this evaluation, would you be willing to be contacted to provide some brief follow-up information on your satisfaction with the results of your search (check one)? _____Yes _____No

Thank you for your assistance.

SEARCH DATA - To be filled out by person conducting search.

---

1. Person Conducting Search____

2. Date________________Logon Time______________Logoff Time______________
(If more than one search was done at this time, please also indicate start and finish times for each search.)___________________________________

3. Off-line Search Preparation Time__________________________________

4. Information Files Used in Search: (Check all data bases used)
(Please place an asterisk next to any data base which was searched but did not provide citations.)

___ERIC ___ABI ___INSPEC ___NAL/CAIN ___AIM/ARM

___Psych. Abs. ___Chem. Abs. ___Eng. Index ___Bio. Abs. ___NTIS

___Soc. Sci. Cit. ___COMPENDIX ___CMA/EMA ___Other(specify)_______

5. Person Doing Search: (check one)

_____Librarian _____Client(alone) _____Client(with librarian assistance)

6. Client Availability: (check one)

_____Client present at time of search

_____Client available by phone at time of search

_____Client not available at time of search

7. Were the search results: (check one)

_____Picked up at main library _____Picked up at branch library _____Mailed to client

8. Comments:____

____

____

9. Number of Prints Ordered____________Date Prints Received______________

Date Prints Sent to Branch____

10. Cost of Search to Library Patron________________________________

Dear DIALOG User:

To assist us in determining both your satisfaction with the results of your DIALOG search and the usefulness of the DIALOG system to the participating libraries, we would appreciate it if you would provide us with the information requested on this form.

Please return this form in the enclosed postage-paid envelope as soon as possible. All information will remain confidential and will be used for evaluation purposes only.

Thank you for your assistance in making this a successful study.

SEARCH TITLE____________________
(If you had more than one search done, please fill out the enclosed shorter version of this questionnaire for each search as indicated by the search title written in on the form.)

NAME____________________

OCCUPATION(please give exact title)____________________

AGE____________________ EDUCATIONAL LEVEL____________________

1. How soon did you receive your results after submitting your search request (indicate approximate number)?

   Number of days__________ Number of weeks__________

2. How many of the citations retrieved in the DIALOG search were actually of use to you (indicate number)?____________________

3. This search was (check one):

   _____Of major value

   _____Of considerable value

   _____Of minor value

   _____Of no value

4. Did the results of your DIALOG search provide sufficient references to answer your question adequately? (check one)

   _____Yes _____No

5. Did you follow-up and obtain copies of documents listed in your search results?

   _____Yes _____No

6. If yes, through what sources did you obtain these documents? (check all sources used)

   _____Main library _____Branch library _____Bookstore

   _____Other (please specify)____________________

7. Did the results of your search indicate other topics that might be of interest to you or help you in redefining your original question?

   _____Yes _____No

8. If yes, did you look for additional information on these new topics?

   _____Yes _____No

9. If yes, please indicate what sources you used to obtain this information. (check all sources used):

____Library Reference Service

  ____Main library ____School library ____Company library

  ____Branch library

____Additional DIALOG search

____Other source (please specify)________________________________

10. Would you be interested in using DIALOG again?

____Yes ____No

11. Please estimate how frequently DIALOG service would be useful to you (check one):

____Daily/Weekly ____Several Times a Month ____Monthly

____Several Times a Year ____Not at all

12. Have you had any previous experience with DIALOG?

____Yes ____No

If yes, indicate approximate number of times.________________

13. Have you had any previous experience with some other information retrieval system?

____Yes ____No If yes, indicate name of system________________

14. What other types of information would you like to see available through DIALOG?________________________________

____

____

15. Do you have a library card?

____Yes ____No If yes, specify which library________________

16. How frequently do you use the library? (check one)

____Daily ____Weekly ____Several Times a Month ____Monthly

____Several Times a Year ____Not at all

17. How frequently do you use the library reference service (excluding DIALOG)?

____Daily/Weekly ____Several Times a Month ____Monthly

____Several Times a Year ____Not at all

18. Comments:____

____

____

____

FORM 5

Dear DIALOG Patron:

Please fill out this form for each additional DIALOG search which you had done. The title of the search for which information is requested is listed on the line below marked Search Title. Thank you.

SEARCH TITLE____

NAME____

OCCUPATION(please give exact title)_______________________________

AGE____________________EDUCATIONAL LEVEL______________________

1. How soon did you receive your results after submitting your search request (indicate approximate number)?

   Number of days__________ Number of weeks__________

2. How many of the citations retrieved in the DIALOG search were actually of use to you (indicate number)?____________________

3. This search was (check one):

   _____Of major value

   _____Of considerable value

   _____Of minor value

   _____Of no value

4. Did the results of your DIALOG search provide sufficient references to answer your question adequately? (check one)

   _____Yes _____No

5. Did you follow-up and obtain copies of documents listed in your search results?

   _____Yes _____No

6. If yes, through what sources did you obtain these documents? (check all sources used)

   _____Main library _____Branch library _____Bookstore

   _____Other (please specify)____________________________

7. Did the results of your search indicate other topics that might be of interest to you or help you in redefining your original question?

   _____Yes _____No

8. If yes, did you look for additional information on these new topics?

   _____Yes _____No

9. If yes, please indicate what sources you used to obtain this information. (check all sources used):

   _____Library Reference Service

      _____Main library _____School library _____Company library

      _____Branch library

   _____Additional DIALOG search

   _____Other source (please specify)

Working Librarian Questionnaire

1. Had you ever conducted searches on an online retrieval system prior to this experiment? _____Yes _____No

   If yes, which system?_______________________________________

   Estimate how frequently you used this system._______________

2. Did you find it difficult to learn online searching?

   Very Diff. Mod. Diff. Diff. Easy Mod. Easy Very Easy

3. Do you feel that adequate training was provided? ____Yes ____No

   Comments:

   Do you feel that additional training is required? ___Yes ___No

   Comments:

4. How long would you estimate it takes to learn online searching techniques?

   Initially (no. of days, months)____________________

   To be proficient (no. of days, months)_____________

   To be expert (no. of days, months)________________

5. Do you think that online search services are a useful reference tool for the public library?

   Very Useful Useful Moderately Useful Not Useful

6. Do you find computerized search services, as compared to manual searches, cost-effective?

   Extremely Cost Eff. Mod. Cost Eff. Cost Eff. Not Cost Eff.

   Comments:

7. How long have you been conducting online searches during this experiment?

   Number of months_______________

8. Approximately how many searches do you conduct during one month?

   Number of searches_____________________

9. How proficient do you feel that you are at conducting online searches?

Extremely Prof. Mod. Prof. Prof. Not Proficient

10. Do you enjoy doing online searches?

Extremely Enjoyable Mod. Enjoy. Enjoy Not Enjoyable

Comments:

11. Do you find online searching time consuming?

Extremely Time Con. Mod. Time Time Consuming Not Time

12. Have you had sufficient time to devote to online searches?

_____Yes _____No

Comments:

13. Have you had sufficient time to devote to reference services not connected with DIALOG? (since the exp. began)

____Yes ____No

Comments:

14. Do you feel that the time you have spent on DIALOG has detracted from other reference services which you provided prior to this experiment?

_____Yes _____No

Explain, if no:

15. Do you feel that the provision of DIALOG service through the public library subtracts from other services that are offered through the public library?

_____Yes _____No In what way?

16. Do you feel that the provision of online services through the public library prohibits the establishment of other potential services that might be offered through the library?

_____Yes _____No What services?

17. Do you feel that the provision of an online search service has given the public library a more innovative and progressive image? ____Yes ____No

If yes, to what groups? _____Library Patrons

General Public____ _____City Officials

Budget Administrators_____

Other groups____________________________

18. Do you feel that public libraries should adopt more technological innovations? ___Yes ____No

Please describe: (i.e. text-editing, SPIRES, BALLOTS)

19. Do you feel that provision of an online search service has had any effect on the type of patron using the reference service?

_____Yes _____No

Describe these changes, if any:

20. Describe the impact of DIALOG on your role and duties as a reference librarian.

21. Describe the impact of DIALOG on the duties of other personnel in the reference department.

22. Describe briefly what other types of data bases you feel would be most useful to public library patrons.

23. How do you feel the service should be supported? (User fees, library budget, some combination, proportion of support for staff time, equipment, etc.)

24. How many computer terminals do you feel are necessary to provide adequate service to the public?__________

(i.e. terminals at only main libraries, central service centers, branch libraries, etc.)

25. Describe any criticisms you have of DIALOG (such as down time, search logic, etc.)

26. Describe any features of DIALOG which you find particularly useful.

27. Describe any suggestions you might have for improving the current service.

28. Describe your personal attitude towards provision of online search services through the public library.

FORM 7

Additional Questions for Head Reference Librarians

1. Describe the priority with which DIALOG questions are handled as compared with other reference questions.

2. Do DIALOG questions come directly from "walk-in" patrons or primarily through mailed requests or requests forwarded from branch libraries?

   Estimate percentage in each category.

3. What is the total size of the reference staff?_________

   Of these, how many do DIALOG searches?_________________

   How were these individuals selected?

4. Describe what kind of impact you feel this experiment has had on the reference service.

5. Describe what kind of impact you feel this experiment has had on the public library as a whole.

6. What do you feel is the most desirable means of supporting this service?

7. Has this experiment changed, in any way, the relationship of the public library to other city agencies?

Such as, in services provided to these agencies, in budget negotiations, in increased awareness of the role of the public library in the community, in attitudes of city officials?

APPENDIX B

PROJECT DIALIB LIBRARY COMPARISON STATISTICS

The following tables present interlibrary comparisons for selected variables for both the free and pay periods. The chi-square statistic compares expected cell frequencies to actual values found in the tables. The Student-Newman-Kuels test provides a posteriori contrasts, testing all possible pairs of group means. Groups of homogeneous subsets, determined by the latter test, are listed in the Interlibrary Contrast column. This column is read as follows: for online citations during the free period, Redwood City (RC) and San Mateo (SM) form a homogeneous subset (i.e., there is no significant difference between group means) which differs significantly from both San Jose (SJ) and Cupertino (CU).

FREE PERIOD

VARIABLE	STATISTIC	PROBABILITY	INTERLIBRARY CONTRAST
Patron Occupations	Chi-Square	0.0000	
Reason for Search	Chi-Square	0.0014	
Publicity Source	Chi-Square	0.0000	
Search time	Student-Newman-Keuls*	0.0000	SJ vs. RC vs. SC vs. CU
Online Citations	Student-Newman-Keuls*	0.0000	RC, SM vs. SJ vs. CU
Offline Citations	Student-Newman-Keuls*	0.0000	SM, SJ vs. SJ, RC vs. CU
Value of Search	Chi-Square	0.3437	
Client Availability at Time of Search	Chi-Square	0.0000	

*.05 Level of Significance

PROJECT DIALIB LIBRARY COMPARISON STATISTICS (cont'd)

PAY PERIOD

VARIABLE	STATISTIC	PROBABILITY	INTERLIBRARY CONTRAST
Patron Occupations	Chi-Square	0.0000	
Reason for Search	Chi-Square	0.0132	
Publicity Source	Chi-Square	0.0000	
Search Time	Student-Newman-Keuls*	0.0000	SJ vs. CU, RC vs. SM
Online Citations	Student-Newman-Keuls*	0.0000	SJ, RC vs CU vs. SM
Offline Citations	Student-Newman-Keuls*	0.0000	SJ, SM vs RC vs. CU
Value of Search	Chi-Square	0.1233	
Client Availability at Time of Search	Chi-Square	0.0000	

*.05 Level of Significance

APPENDIX C

CHANGES IN ONLINE SEARCH TIMES BY MONTH

The following tables indicate,for both the free and pay periods, the percentage of total searches completed during each month which falls into one of four discrete categories. The data in Table C-1 indicate that the most noticeable changes during the free period took place in the two extreme categories (less than 10 minutes or greater than 30 minutes). The percentage of searches falling into the first category (less than 10 minutes) nearly tripled over the nine month period. Similarly, the percentage of searches falling into the last category (greater than 30 minutes) was cut in half by the end of the nine month period. Changes in the middle categories were not nearly as pronounced.

TABLE C-1

ONLINE SEARCH TIMES BY MONTH - FREE PERIOD
(Per Cent of Total Monthly Searches)

	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	TOTAL
Less than 10 minutes	9.1	14.1	10.6	21.0	29.5	28.5	33.9	33.5	29.3	26.6
10-20 minutes	25.4	26.9	26.9	26.3	24.9	29.7	32.3	29.3	34.2	29.2
20-30 minutes	25.4	19.2	21.9	22.3	18.4	20.9	17.0	18.7	19.2	19.6
More than 30 minutes	40.0	39.8	40.6	30.4	27.2	20.9	16.9	28.4	17.1	24.6
N =	55	156	160	171	217	240	249	385	287	1920

The data in Table C-2 indicate, for custom searches, that the percentage of searches falling into each category did not change much throughout the pay period. The number of standard searches completed was so low for each month that it is impossible to identify any trends in the data.

TABLE C-2

ONLINE SEARCH TIMES BY MONTH - PAY PERIOD
(Per Cent of Total Monthly Searches)

	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
STANDARD											
Less than 10 minutes	11.1	36.4	37.5	40.0	33.3	28.6	0.0	0.0	0.0	55.6	28.9
10-20 minutes	22.2	36.4	37.5	20.0	66.7	57.1	33.3	40.0	50.0	22.2	34.2
20-30 minutes	55.6	27.3	12.5	20.0	0.0	0.0	66.7	60.0	0.0	11.1	25.0
More than 30 minutes	11.1	0.0	12.5	20.0	0.0	14.3	0.0	0.0	50.0	11.1	11.8
N =	9	11	8	10	6	7	3	5	2	9	70
CUSTOM											
Less than 10 minutes	42.1	62.5	44.1	50.0	56.9	45.6	44.2	41.8	33.3	46.1	45.3
10-20 minutes	31.6	29.2	26.5	34.8	23.1	31.6	25.6	36.4	42.4	30.4	29.9
20-30 minutes	15.8	8.3	20.6	10.9	12.3	17.5	14.0	9.1	9.1	13.7	12.3
More than 30 minutes	10.5	0.0	8.8	4.3	7.7	5.3	16.3	12.7	15.2	9.8	12.5
N =	19	24	34	46	65	57	43	55	66	102	511

APPENDIX D

PROFILES OF NON-CIN LIBRARIES

(Profiles of the non-CIN libraries are presented in this appendix to provide some background for the librarian comments presented in Appendix B of the main volume. Because the search volume at each of these libraries was extremely low during the starting period, no meaningful quantitative data could be derived for any of the libraries.)

LONG ISLAND LIBRARY RESOURCES COUNCIL

The Long Island Library Resources Council (LILRC) is one of nine regional corporations administered by the New York State Commissioner of Education. The Council consists of a group of public library systems (and their member libraries); libraries in institutions of higher education, and other non-profit organizations; and libraries in for-profit business or commercial firms.

The Cooperative Information Services Committee (CISCO) of the LILRC organized and initiated DIALOG service. Project CISCO "is designed to provide or supplement access to machine-readable data bases which might otherwise be unavailable to Long Island's research community."

While members of the Council include a wide range of libraries, public libraries are particularly encouraged to join. Annual membership dues are $25 per year plus fees for interlibrary loan service. Public libraries, however, do not pay the interlibrary loan fees.

Impetus for the project was actually provided by the Brookhaven National Laboratory, which offered the use of one of its terminals to the Council. In January, 1976, two sessions were held to acquaint reference librarians in Nassau and Suffolk counties with DIALOG service. Most searches completed since that time have been requested by librarians who attended one of the sessions. The cost of a search includes on-line time plus an overhead fee of $20 per hour. The overhead fee is intended to cover all costs associated with the operation of the service. The terminal is provided by Brookhaven at no cost to LILRC. Publicity for the service has been limited to a brochure which was sent to all LILRC members in January.

One of the operating principles of the service is that the patron does not have to be present at the time of the search. Also, LILRC does not normally provide documents for the patron after completion of the search. Patrons must go back to the library at which the search was requested to obtain documents. A member library can then obtain documents through the Council by using the interlibrary loan procedures. Billing for the service is done directly by the individual responsible for conducting the search. Bills are sent on to the patron with the search results.

LILRC has one staff member responsible for conducting all searches. The Brookhaven terminal is available to the LILRC operator two mornings a week, although arrangments for other times are possible. The staff member does try to spend as little time on-line as possible by doing a great deal of off-line preparation.

The LILRC will recommend alternate search services to a patron, especially if the patron wishes to be present at the time of the search. Adelphi University and the New York Institute of Technology will do searches for outsiders for a fee. In addition, the State University of New York will do searches for individuals on both BIOSIS and ERIC.

CLEVELAND PUBLIC LIBRARY

The Cleveland Public Library serves primarily the city of Cleveland, although persons from all Northeastern Ohio regularly use the facilities. The library houses 3,356,515 volumes and includes 17 subject departments. In addition to the central Main Library building, there are 35 branches located throughout Cleveland.

In September, 1975, the library initiated "Facts for a Fee" - a fee-based reference service - in response to requests for information beyond the scope of library policy on free research and outside the library's geographical area of responsiblity. Facts for a Fee is aimed mostly at business and industry. The service is available on a contractual basis at $25 per hour. There is a minimum charge of $25. The staff includes three part-time individuals. Publicity for the service has consisted mainly of brochures which were sent out to large companies in Northeastern Ohio.

Reference service requests are screened by an office at the Main Library. Those requests which exceed the 15 minute time limit imposed on such requests by the library are referred to Facts for a Fee. Individuals making such requests receive a brochure from the library explaining the fee-based service. In addition, individuals coming to Facts for a Fee are given some evaluation by staff members of whether or not it is profitable to have them conduct a reference search. Alternate suggestions are provided if the service is not considered to be profitable to the patron.

DIALOG searches are offered through Facts for a Fee. Charges for the service include the cost of the data base(s) used, the Facts for a Fee charge of $25 per hour, a communications charge of $10 per hour, and offline printing and photocopying charges where desired. There has been no publicity on the DIALOG aspect of the service to date. However, a DIALOG brochure is available for distribution and a news release about DIALOG is being prepared for the Greater Cleveland Growth Association Newsletter.

One staff member is responsible for conducting all DIALOG searches. This DIALOG operator received a one-day training course from a Lockheed representative. Eventually, the DIALOG operator would like to train other librarians to conduct searches. Until this is possible, however, reference librarians in special departments are consulted when necessary on search topics.

HOUSTON PUBLIC LIBRARY

The Houston Public Library serves the metropolitan Houston area and includes 25 branches. A fee-based reference service, called Business Information Service (BIS), has been in existence at the library for about one year prior to the introduction of DIALOG. BIS charges patrons $15 per hour. However, patrons do not have to go through BIS to obtain a DIALOG search. Those patrons who have searches done independently of BIS are charged only for connect time and for offline prints. No charges are made for staff time. Currently, the reference department at the Houston Public Library handles about 21,000 reference requests per week. DIALOG requests are a small portion of this work load.

Even after DIALOG service had been in operation in Houston for several months, very few requests for the service were received. The majority of patrons of the service are special libraries. The principal reason for the lack of use of the service is probably due to the fact that no publicity has been undertaken. In fact, the only current publicity source is word-of-mouth. The library does have plans to publicize the service.

One of the difficulties in publicizing the service, however, is the attitude of the staff at Houston towards fee-based services. Presently, the staff is in the process of re-evaluating the entire fee-for-service rationale. There is a great deal of concern among staff members about the image of the public library and how it will be affected by fee-based services. In fact, there is strong reluctance towards charging for any reference services. In keeping with this philosophy, DIALOG requests are not funneled through BIS unless there is a time factor involved, i.e., rush jobs go through BIS.

The Houston Public Library staff does feel that DIALOG service could be useful to the population the library serves. They hope, therefore, to continue the service and have already submitted a budget request for a terminal for next year.

MINNEAPOLIS PUBLIC LIBRARY

DIALOG service at Minneapolis is operated through INFORM, a fee-based research service of the Minneapolis Public Library and Information Center whose purpose is to provide information on demand and in a useable form. The INFORM staff consists of one full-time librarian, one part-time librarian, and one clerical person. Charges for the service include $25 per hour for professional time, $10 per hour for extensive clerical tasks which require little or no professional time, and charges for photocopying, long distance calls and any other expenditures made on behalf of the client. The minimum charge for a new client is $25. Clients are asked to present a letter of intent or sign a simple contract stipulating the search topic, any limitations on the searching time, and when the information is to be presented. All search questions and client's names are kept confidential. Since 1970, INFORM has handled about 600 information searches annually.

INFORM added DIALOG service in September, 1975. Publicity for DIALOG consisted principally of one article carried in the Minneapolis Tribune in September, 1975. Some advertising is also done in local and regional periodicals. However, word-of-mouth is responsible for most searches.

DIALOG searches are conducted as an integral part of the general INFORM service. Thus, searches are usually initiated by the INFORM staff rather than as a result of a direct request from a client.

INFORM staff have estimated that DIALOG can provide answers for between one-third and one-half of the inquiries received. One of the main concerns, however, is whether or not the computer search will be complete, quick and less expensive than the manual method.

APPENDIX E

THE COST OF ON-LINE BIBLIOGRAPHIC SEARCHING

Michael D. Cooper

Nancy A. DeWath

ACR-003-75-01

Technical Report

The Cost of On-Line Bibliographic Searching

Michael D. Cooper

Nancy A. DeWath

December 1975

Applied Communication Research
P.O. BOX 5849 STANFORD CALIFORNIA 94305

This paper reports a project commissioned by Applied Communication Research, Inc. as part of an on-going program studying potential user interfaces for on-line search services.

This research program is funded by the Office of Science Information Service, National Science Foundation, through grants to the Lockheed Missiles and Space Company (GN42299) and to Temple University (GN42271). Applied Communication Research, Inc. serves as an evaluation subcontractor to both projects.

Alice E. Ahlgren is program manager of the ACR evaluation of the Lockheed DIALIB project. Colin K. Mick manages the ACR-Temple effort.

As noted in this report, the study was conducted during the first year of a two-year project -- during the "free service" portion of the study. As a result, the various time estimates have been affected by a number of variables. The time estimates presented here may therefore be misleading for the following reasons.

1. The searchers were still in a learning mode -- the learning curve for searching (shown by time per search) started at 31 minutes per search and dropped to about 18 minutes at the end of the free period (mean for the free period was approximately 23 minutes).

2. Our data from the pay period (which began in June, 1975) indicate that the searchers are now becoming more sophisticated and tend to devote more time to off-line search preparation and less time to actual on-line searching.

ACR, Lockheed and the participating libraries are now discussing the possibility of replicating this study during the pay period.

ABSTRACT

A cost analysis of 411 on-line bibliographic search requests was conducted. The study involved monitoring the time that 35 individuals in four public libraries spent processing these requests. The study identified a set of seven tasks that are performed for each request and determined the average time and cost for each of the tasks. The average total search cost was $28.41 exclusive of telephone line charges. This figure included the data base connect charges of $17.29. The average time to process a request was 7.8 calendar days. A wide variation in the cost and time figures was found among the four libraries and among individual searchers.

INTRODUCTION

On-line bibliographic searching is becoming commonly used as an aid to the reference librarian and researcher. Commercially available systems, such as Lockheed's DIALOG and System Development Corporation's ORBIT, provide access to a multitude of machine searchable data bases for this purpose. Many issues remain unresolved with respect to the general process of on-line searching. These issues include questions such as the effectiveness of on-line searching, methods for training searchers, and optimal search strategies at the terminal. This paper examines the cost of on-line searching. On-line search costs include the charges that are incurred for connection to a commercial search service, the cost of printing bibliographic citations, and the cost of the reference librarians' time.

There are a number of reasons for studying the cost of on-line searching. In the first place, it seems apparent that on-line searching is a close substitute for some forms of non-computerized bibliographic searching. If this is the case, and if the end product is the same, then it is important to know how the costs of the alternatives compare. Secondly, costs are an important tool to aid in resource allocation. The provision of any new service implies either additional funding or a diversion of funds from one type of service to another. With cost data this type of decision can be aided considerably. Finally, costs can provide a basis for making pricing decisions. It seems quite likely that users will have to pay for on-line bibliographic search services. The question is, how much? While there are numerous ways in which prices can be set (i.e., loss leader, marginal cost, cost recovery), a knowledge of costs can play an important part in their establishment.

The cost data reported in this paper were compiled as part of an ongoing project being conducted by the Lockheed Palo Alto Research Laboratory under the sponsorship of the National Science Foundation's Office of Science Information Service. As part of the study, Lockheed's on-line reference retrieval service (DIALOG) is being made available through four public libraries in the San Francisco Bay Area. On-line search services were provided at no cost to patrons during the first year of the project (August, 1974 through May, 1975). The search service is being provided at a reduced cost to patrons during the second year of the project (June, 1975 through May, 1976).

The four libraries participating in the project are all members of the Cooperative Information Network (CIN), a Bay Area consortium of public, special, and academic libraries. CIN, in cooperation with Lockheed, selected four public libraries in San Mateo and Santa Clara counties as sites for the placement of computer terminals. The sites included the Redwood City Public Library, the San Mateo County Library, the Santa Clara County Library, and the San Jose Public Library. All libraries in the CIN network were encouraged to participate in the experiment by either directly referring patrons or by forwarding patron requests to one of the above libraries.

The individuals who performed the on-line searching and search-related interviewing had (with rare exceptions) no previous experience with on-line searching (1). A core of eight librarians (two from each library) received the standard Lockheed introductory course on DIALOG (2 days) and were allowed time to practice searching. These librarians then provided the search training to other staff members of their respective libraries.

The experimental nature of this project differentiates it from the normal search situation. During the first year of the project, each of the four participating libraries received both 16 hours per month of free search time and 16 hours per month of free demonstration time. Since the search time was free, searchers were able to experiment with the system while conducting patron searches. They were not under any pressure to keep the searches short and efficient. On-line search times, and subsequently connect costs, reported in this paper may be somewhat higher than they might have been if this were not an experimental project in which free search time was available to the libraries.

PREVIOUS STUDIES

The development of adequate statistical (time, cost) monitoring mechanisms in on-line systems has been a slow process. Monitoring programs took a large leap forward with the advent of commercial systems which require the precise recording of user-system interaction time for accurate billing purposes.

Monitoring of the user-system interaction can take many forms. The simplest measurements deal with elapsed search time, time spent searching particular data bases, and frequency of command utilization. One of the earliest reports on user behavior as monitored by a retrieval system was presented by Summit (1969). Data reported included elapsed search time, number of index terms used in a search, number of Boolean expressions used in a search, and number of citations printed by the system. Subsequently, there have been a number of other analyses. Of particular note is a study by Benenfeld et al. (1974) which reported a comprehensive set of characteristics of on-line searches. Among the variables computed were the time required to discuss the search with the patron, the search time at the terminal, the number of citations printed out, and the total user cost of the search. Benenfeld's experience indicated user costs per search in the range of $28 to $56 depending on the data base used. Lawrence, Weil, and Graham (1974) also gathered cost data on bibliographic searching and Elman (1975) surveyed some of the previous studies and presented his own computations indicating that an average on-line search cost $47. Another aspect of on-line search costing that has received some attention in the literature is the cost of operating the computer equipment. Lancaster (1973) reviewed some of this literature. It is apparent that this area of cost analysis needs considerably more investigation before the internal economies of on-line searching can be settled.

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(1) It is only fair to note that one of the authors of this paper was also one of the searchers being studied, an employee of San Mateo County Library. We hope that no bias resulted.

METHODOLOGY

The procedure for obtaining the data from which to compute the cost of on-line bibliographic searching required the cooperation of all individuals engaged in processing the on-line search requests. A set of seven tasks was defined including reference interview, originating library preparation, DIALOG library preparation, search, DIALOG library follow-up, originating library follow-up, and follow-up with patron. A form was then developed to collect data describing the amount of time spent on each task, the date on which the task was performed, and the individual who performed the task (Appendix A). This time sheet traveled with the search request through its processing. As completed time sheets were received, they were numbered and coded for computer processing. In order to protect the anonymity of the library employees performing the various tasks, employee names were replaced with code numbers for all computer tabulations. In the tables that refer to individuals performing search tasks, code numbers will be used.

Costs were developed both for each search performed and for each task within a search. Each task could be performed by a different individual. In order to arrive at the direct labor cost for a search, it was necessary to multiply the pay rate for each individual involved in the search by the number of minutes each spent at a particular task.

In addition to the labor cost of a search, two other costs must be considered. The first is the fee paid to the commercial search service (in this case, Lockheed) to access their data base. This fee is a function both of the length of time one is connected to the system via telephone line and of the particular data base (such as ERIC, NTIS, Psychological Abstracts, etc.) that is being searched. For each request, multiple data bases may be searched. In computing the on-line cost for a search, the cost per hour of accessing each data base was multiplied by the connect time to arrive at a total data base connect cost.

The second non-labor cost element is the number of bibliographic citations printed at the commercial vendor's computer center and sent by mail to the searcher's location. A charge is made for these off-line prints and this adds to the total cost of the search.

Several other factors could be included in the cost of a search. The major omission of this study was the cost of telephone line charges. Since all the libraries were relatively close to Lockkheed's computer center, they dialed directly to the center without the use of an intermediary service such as TYMSHARE. If an intermediary service had been necessary, these charges would have to be included in the total search cost.

Other cost elements that were excluded from the study were terminal rental costs, physical space charges, and indirect costs of overhead, administration, supplies, etc. Basically, the cost figures presented here summarize the direct costs of on-line searching.

The data for this study were collected during February, March, and part of April of 1975. Under the terms of the National Science Foundation grant, DIALOG service was provided free to the public for the first year of the experiment, and at a reduced rate for another year. The three month study period was one which occurred six months after the project had begun and during which the service was still free to all users.

It should be emphasized that the data comes from self-reports of the library personnel. Such a method is of course less accurate than an outside measure, but was the only practical way to collect the amount and variety of data needed.

At the end of the data collection period, 411 usable time sheets had been collected from the four DIALOG libraries (Table 1). Of these 411, 33.6% were from Redwood City Public Library, 25.1% from Santa Clara County Library, 22.6% from San Mateo County Library, and 18.7% from San Jose Public Library. Branch libraries and other CIN libraries took requests and relayed them to the DIALOG libraries; 16% of the requests during the reporting period showed some participation by these other libraries.

THE REQUEST PROCEDURE

A general outline of the DIALOG request procedure is flowcharted in Figure 1. For the data collection, the process was divided into seven tasks which formed the basic reporting units on the time sheet (Appendix A).

The tasks were defined by both where and at what stage of the search process the activity took place. A maximum of two possible types of libraries participated in each search: a library with a terminal (called DIALOG library) and a cooperating library, a branch library, or other CIN member (called originating library). The tasks were further divided according to whether the activity occurred before or after the actual on-line search. The DIALOG search itself was treated as a separate task. The tasks were defined as follows:

REFERENCE INTERVIEW: time that the user spent negotiating the request by submitting and discussing it with a library staff member. This could take place at either a DIALOG library or an originating library.

ORIGINATING LIBRARY PREPARATION: If the reference interview was at a cooperating library, the staff there might spend some time recording, researching, and transmitting the request.

DIALOG LIBRARY PREPARATION: time spent on the request at the DIALOG library with no patron present and before performing the on-line search. Typical activities included recording the receipt of the request, filling out forms, and researching search terms.

DIALOG CONNECT TIME or ON-LINE SEARCH TIME: the actual DIALOG search.

DIALOG LIBRARY FOLLOW-UP: time spent after the on-line search, with no patron present. Typically this would include filling out reporting forms, examining search results, and notifying the patron or originating library.

ORIGINATING LIBRARY FOLLOW-UP: analagous to DIALOG library follow-up, but at a cooperating library.

FOLLOW-UP WITH PATRON: at either type of library, the staff might spend time with the patron explaining the results of the search.

The only one of these activities that was essential was the actual on-line search. Any combination of the other activities might be performed, depending on the nature of the request and on the library or libraries involved. The individual libraries varied this general form in accordance with their own needs and policies.

The Santa Clara County Library is a large system with branches all over the county and a research library in Cupertino where the terminal was located. Users were free to submit requests through branch libraries or at the Cupertino library. Over the course of this study, virtually all requests originated at Cupertino. The requestor, on entering the Cupertino library, was directed to a DIALOG-trained staff member, if possible, who performed the reference interview. The librarian asked the patron if she/he wished to be present during the search, in which case an appointment was arranged for some time in the future. Scheduled searches were limited to three or four per day, due to the demands of other staff duties. If the user did not ask to be present, the search was performed at the searcher's convenience, often but not necessarily by the same person who had performed the reference interview. The user was called either when the on-line search was finished or when the off-line prints were received. Whenever possible a DIALOG staff member discussed the results with the patron.

The Redwood City Public Library consists of a main library and two small branches. Users with reference questions requiring the facilities of the main library were sent there directly, as were DIALOG requestors. When possible they were met by a DIALOG-trained reference librarian, who performed both the interview and search. The user was then called to come in to pick up the results and was met by a reference librarian if possible. Occasionally, the results were mailed to the patron.

The San Jose Public Library serves a metropolitan area. The users with questions on DIALOG were referred to the main library's science/business department whose personnel included two searchers. The other staff members in the department were also familiar with DIALOG. The user filled out the request form, and might have been briefly questioned by the staff. The primary searcher during the data collection period was a student volunteer who came in part-time to perform searches. No particular effort was made to have the patron talk with her, although she telephoned the requestor if she needed clarification of his/her request. The patron was notified, when the results were ready, by the searcher who explained the results, and the results were left in the science/business department to be picked up. A note was attached to the results encouraging the requestor to talk with the searcher if s/he did not understand the citation or was interested in obtaining specific articles.

The San Mateo County Library alone among the DIALOG libraries derived a substantial portion (about 60%) of its requests from other libraries. Like the Santa Clara County Library, users were allowed to place requests with the main library or with a branch or other CIN library; unlike Santa Clara, many users opted for the remote access. A librarian, although not necessarily one very familiar with DIALOG, generally performed a reference interview for each request. Searches received from other libraries or from walk-in business were placed with all other pending searches, to be performed at the librarians' convenience. The results were often sent to a branch library, even when the request originated at the main library.

Table 1

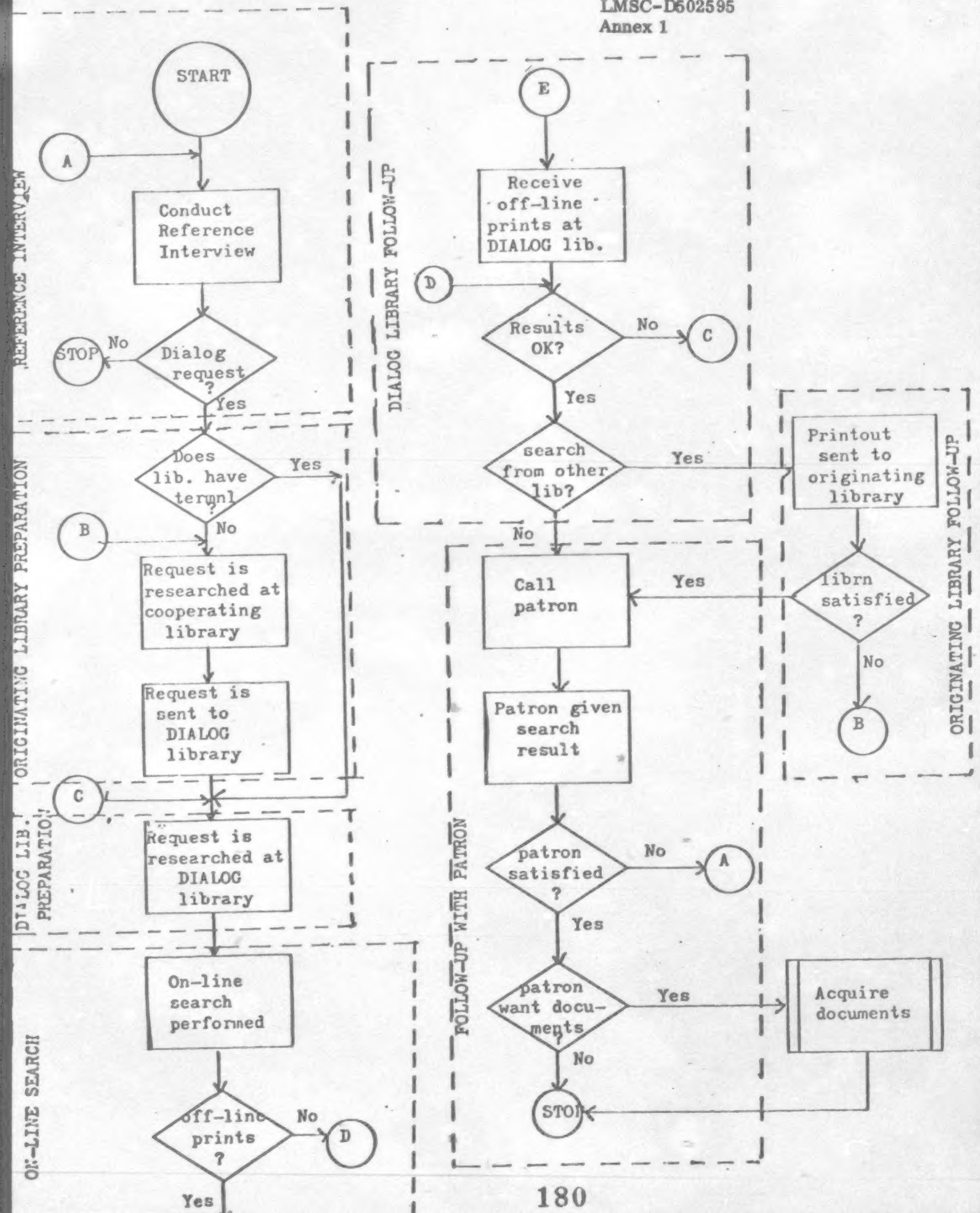
Frequency Distribution of Requests by Dialog Library

Library	Number of Requests	Percent Distribution of Requests
Redwood City (RC)	138	33.6
Redwood City	137	33.3
Menlo Park[1]	1	0.2
Santa Clara County (SC)	103	25.1
Cupertino Research Center	95	23.1
Gilroy	3	0.7
Others[1]	5	1.2
San Mateo County (SM)	93	22.6
Central Library	37	9.0
Atherton	20	4.9
Belmont	6	1.5
Foster City	3	0.7
Millbrae	2	0.5
Woodside	1	0.2
Public Health and Welfare[1]	20	4.9
Other	4	1.0
San Jose Public Library (SJ)	77	18.7
Total	411	100.0

[1] An independent library that sends its requests to the indicated Dialog library

FIGURE 1

FLOWCHART OF DIALOG REQUEST PROCESS


REFERENCE INTERVIEW
START
A
Conduct Reference Interview
Dialog request ?
No
STOP
Yes
ORIGINATING LIBRARY PREPARATION
Does lib. have termnl ?
Yes
No
B
Request is researched at cooperating library
Request is sent to DIALOG library
C
DIALOG LIB. PREPARATION
Request is researched at DIALOG library
ON-LINE SEARCH
On-line search performed
off-line prints ?
No
D
Yes
DIALOG LIBRARY FOLLOW-UP
E
Receive off-line prints at DIALOG lib.
D
Results OK?
No
C
Yes
search from other lib?
Yes
No
ORIGINATING LIBRARY FOLLOW-UP
Printout sent to originating library
librn satisfied ?
Yes
No
B
FOLLOW-UP WITH PATRON
Call patron
Patron given search result
patron satisfied ?
No
A
Yes
patron want documents ?
Yes
Acquire documents
No
STOP

STAFF

One major decision for a library instituting this kind of service is that of how to staff the service. The libraries considered two major alternatives.

First, they could designate one or two people to do all the searches. The advantage to this would be that the searchers would quickly become highly skilled. Also, the responsibility for DIALOG and DIALOG-related activities would be clearly assigned. However, it would mean that at times the search staff would not be available to users with questions or problems.

The alternative was to have all of the reference personnel add DIALOG searching to their usual repertoire of reference skills. This would diffuse the searching, and therefore diffuse both the experience and the responsibility. However, it would increase the availability of trained personnel to users so that a request could be handled efficiently by virtually anyone at the reference desk.

Three of the libraries opted for the second alternative. At San Jose, however, due to special circumstances (1), most of the searching eventually devolved on one person.

All of Redwood City's staff who participated in DIALOG performed, at one time or another, almost every step of the procedure, including the on-line search. Generally, a librarian followed one request through from beginning to end. Santa Clara County showed roughly the same pattern, although they did have a few requests that originated at cooperating libraries so that the people who dealt with the patron did not perform searches.

At San Mateo County Library, staff members from other county system libraries frequently conducted some of the search tasks. Of the twenty people who were listed on time sheets, only five performed searches, and only four could be characterized as regular searchers.

Table 2 summarizes the salaries of the 37 employees involved in processing the on-line search requests. Participants' mean salaries for the job title ranged from a low of $658 per month for three library assistants to a high of $1325 for a supervisory librarian (2). For future reference, the table also shows the employee code numbers (instead of employee names) for each job title within each library.

(1) Near-by San Jose State University threatened to swamp San Jose Public Library with requests, so an arrangement was made whereby a library school student volunteer did a large proportion of the searching.

(2) Employees of each of the cities and counties in the study worked a different number of hours per week. Redwood City employees worked 38 hours per week while employees of Santa Clara, San Mateo and San Jose worked 40 hours per week. When labor costs were computed this factor was considered.

Table 2

Salary Schedule for Library Employees Involved in Dialog Process

Library	Job Title	Mean Monthly Salary	Employee Code Numbers in this Classification	Number of Employees
Redwood City	Librarian I	$1,000.50	24, 25, 27	3
	Librarian II	1,083.00	26	1
	Librarian III	1,178.50	23	
Santa Clara	Libr.Assist. I	764.00	40	1
	Librarian I	974.50	35, 36, 37	3
	Librarian II	1,074.50	38, 41, 43	3
	Regional Librarian I	1,128.50	42	1
	Supervising Librarian	1,306.00	44	
San Mateo	Libr.Assist. I	658.00	2, 9, 11	3
	Libr.Assist. II	801.00	13	1
	Librarian I	992.00	1,10,12,14,16,17,18	7
	Librarian II	1,112.50	6, 7, 8	3
	Librarian III	1,232.00	4	1
	Supervising Librarian	1,325.00	15	1
San Jose	Librarian I	955.00	50*, 51, 53, 56	4
	Librarian II	1,052.50	52 54, 55	3

*Unpaid volunteer; salary calculated at Librarian I level for purpose of study

Table 3

Task Frequency of Occurrence by Employee

Library	Employee Code Number	Task: Reference Interview	Task: Originating Library Preparation	Task: Dialog Library Preparation	Task: Search	Task: Dialog Library Follow-up	Task: Originating Library Follow-up	Task: Follow Up With Patron	Total Frequency
San Mateo County	3	15	20	16	19	8	17	9	104
	5	2		9	26	39		7	83
	6	2	3				4	3	12
	8	10		18	20	27		12	87
	9			33		3			36
	10	10		16	22	22		3	73
	14	8	12				10	2	32
	15	1		9	8	11		1	30
	Others[2]	16	8	4		1	7	6	42
Total SMCo.[1]		64	43	105	95	111	38	43	499
Redwood City	23	41		11	66	25		11	154
	24	16		13	24	22		17	92
	25	21		4	30	22		2	79
	26	11		15	22			4	52
Total RCPL[1]		89		43	142	69		34	377
Santa Clara County	35	43		13	41	41		25	163
	36	23		8	34	35		14	124
	37	16		26	30	29		18	119
	38	4							4
	40	1	1						2
	41	2	1					1	4
	42	3	1						4
Total SCCo.[1]		92	3	47	105	105		68	420
San Jose	50	12		27	36	34		6	115
	51	7		1	1				9
	52	7		5	15	7		2	36
	53	22		21	27	21		21	112
	54	2							2
	55	4		3	7			1	15
	56	2				6		1	9
	60				1				1
Total SJPL[2]		56		57	87	68		31	299
Total all Libraries[1]		301	46	252	429	353	38	176	1595

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[1] Totals differ from other totals elsewhere because a) a task may be performed more than once per search, and b) tasks for which staff member could not be identified were eliminated from this tabulation.

[2] A total of 13 individuals performed the 42 tasks that are combined in this entry.

In Table 3 data are presented on the frequency with which various employees performed each of the seven tasks connected with a search. For the entire experiment, 1595 tasks were performed for the 411 search requests averaging about 3.6 tasks per search. 429 searches were performed for the 411 requests indicating that very few duplicate searches were made for each request. Employee 35 at Santa Clara County performed the greatest number of tasks while employee 23 at Redwood City ranked second. Together these two employees accounted for 20% of all tasks performed.

DATA BASES

One possible source of variation among the libraries was the choice of data bases used for the search. Since the different bases cover different subjects, variations in base use could indicate that the libraries receive different types of requests, and/or that the librarians' search habits differ. Also, since the bases' hourly rates vary, differentiated use could affect the cost of searching (See Table 4).

The most commonly used bases (1), for all the libraries taken together, were NTIS (accounting for 17.84% of the bases used), Psychological Abstracts (16.57%), and ERIC (13.35%) (Table 5). NTIS is a highly varied base that covers a wide range of topics, and the documents abstracted were readily available to the project participants through purchase from NTIS or on loan from the California State Library. Pyschological Abstracts (PA) and ERIC cover psychology and education, respectively. All three of these could be expected to be of use to many public library patrons. The next most used bases were Social Science Citations Index (9.51%), COMPENDEX (COMPuterized ENgineering InDEX; 9.29%), and Chemical Abstracts Condensates (8.23%). The first ties in well with the first three bases; the latter two are equivalent to well-known hard-copy services. The least used bases were all Predicasts bases, including PATS Source (.11%), PATS Claims (.21%), and PATS Chemical and Electronic Market Abstracts Weekly (.85%). All are special-purpose bases.

Considering the libraries individually, their data base usage did differ from the group percentages, but not markedly. For example, the group proportion for NTIS is 17.84%; Redwood City's figure was 19% as were Santa Clara's and San Mateo's; while San Jose's was 13%. Psychological Abstracts' group percentage was 16.57%; the individual proportions were 18%, 14%, 22% and 13%.

(1) More than one base may be used on a search; these are the proportions of bases used, not of searches performed.

Table 4

Data Base Connect Charges Per Hour

Data base name	Charge per connect hour	Charge per off-line print
ERIC	$ 25	$ 0.10
CHEM ABSTRACTS	45	0.10
EXCEPT. CHILD ABS	25	0.10
NTIS	35	0.10
SSCI	70	0.10
COMPENDEX	65	0.10
AIM-ARM	25	0.10
NAL/CAIN	25	0.10
PSYCH ABSTRACTS	50	0.10
INSPEC-PHYSICS	45	0.10
INSPEC-ELECT. EN	45	0.10
INSPEC-COMPUTERS	45	0.10
ABI/INFORM	65	0.10
PATS CMA/EMA	90	0.20
PATS C/EMA WEEKLY	90	0.20
PATS F and S	90	0.20
PATS Source	90	0.20
IFI/Claims	$ 150	$ 0.10

These were the bases available during the data collection period.

Table 5

Data Base Usage by Library

Data Base Name	Number of Data Base Uses by Library				Total Uses	Percent Distribution of Uses
	Redwood City	Santa Clara	San Mateo	San Jose		
ERIC	44	38	18	25	125	13.35
CHEM.ABSTRACTS	29	15	21	12	77	8.23
EXCEPT.CHILD,ABS.	2	3	5	6	16	1.71
NTIS	61	45	35	26	167	17.84
SSCI	32	27	5	25	89	9.51
COMPENDEX	24	27	5	25	89	9.29
AIM-ARM	1	1	3	5	10	1.07
CAIN	14	5	12	9	40	4.27
PSYCH. ABSTRACTS	56	33	40	26	155	16.57
INSPEC-PHYSICS	12	7	4	2	25	2.67
INSPEC-ELECT.ENG	4	12	2	2	20	2.14
INSPEC-COMPUTERS	2	4	3		9	0.96
ABI-INFORM	20	11	11	20	62	6.62
PATS CHEM ELECT	7	10		6	23	2.46
PATS CHEM-EL WEEK		3		5	8	0.85
PATS F and S	10			10	20	2.14
PATS SOURCE	1				1	.11
CLAIMS/PAT PRES	1			1	2	.21
TOTAL	320	243	180	193	936	
Present Distribution	34.19	25.96	19.23	20.62		100.00

Although on the library level no significant differences appear, when broken down further to show the individual searches, differences become apparent (Tables 6 and 7). The most skewed figures are for searcher 3, who is a special librarian and whose search pattern reflects the specialized interests of her clients. The other searchers, however, have no such easy explanation for their preferences. Looking at the most frequently used base, NTIS, the frequency of use varies from 6.4% to 23.8% (Table 7). Even excluding searcher 3, Psychological Abstracts varies from a low of 4.9% all the way up to a high of 30.8%.

We can only guess at reasons for this variation. It may be that some searchers have certain subject expertise, and that the searches within a library are parcelled out accordingly. However, none of the libraries reported any such pattern to their searching. It is more likely that users fall into habits of searching and tend to use bases with which they are familiar. The most frequent searchers (23 and 50) show more of a scattering among the bases, so it may be that their added experience has encouraged them to branch out more, while other searchers stick with "safe" bases. Also, doing more searches will no doubt bring the searcher a greater variety of topics, and require a greater variety of bases. These are just conjectures, as the figures are not conclusive. If the searchers were either very conservative in their use of "new" bases or were strictly segregated by subject, they would center their searches on a handful of bases. However, almost all of them used each of the more popular bases at least once.

Table 8 breaks down the average time spent on each data base by the most active searchers. Again, the results show very little uniformity among the searchers. No one base tends to be a time-consuming base. The searchers varied widely in the average time that they spent on a single base. There seems to be some intra-library similarity, but it is very slight; the San Mateo County Library searchers all had fairly low averages, the Redwood City searchers a little higher, the San Jose people about the same as Redwood City or perhaps a little higher, and Santa Clara County highest of all. These figures are not directly comparable with the mean on-line time per search, since any number of bases can be used on a single search. However, they are something to keep in mind for the discussion of time per task that follows. If a search used the same number of bases, and the average time per base differed among the libraries, the average on-line time per search should vary accordingly.

OFF-LINE PRINTS

The number of off-line prints requested was a major variable in the cost of the search. San Mateo County tried not to print more than fifty citations per search, but that was not a hard and fast rule. There were two reasons for this guideline. First, the number of prints available under the terms of the grant was limited (although no library overran this limit during the first year of the study). Second, if the patron received too many prints with too much irrelevant information, the precision and therefore the quality of the search was lessened.

Table 6

Data Base Usage by Searcher

Library	Employee Code Number	Data Base Use Frequency											Total Uses by Searcher
		ERIC	CHEM. ABS.	NTIS	SSCI	EI	CAIN	PA	INSPEC-P	ABI	PATS C/EMA	Other	
San Mateo County	3			7	3			15		4		1	30
	5	8	6	9	1	9	1	6	1	1		9	51
	8	7	3	8		7	1	8					34
	10	3	4	10	1	4	4	10	2	6		3	47
Redwood City	23	19	10	36	14	12	6	27	8	9	4	7	152
	24	13	2	5	7	1	2	16		2	1	3	52
	25	9	6	11	8	4	4	7	3	9	1	8	70
	26	2	10	8	5	7		5	1		1	3	42
Santa Clara County	35	17	2	14	13	9		14	3	3	2	9	86
	36	18	3	10	10	5	3	15	2	1	2	4	73
	37	3	10	20	4	15	2	4	2	7	4	9	80
San Jose	50	13	8	11	16	9	3	19	1	7	1	12	100
	52	2	3	7	2	2	4	2	1			5	30
	53	10	1	3	4	2	2	4		7	3	11	47
All Others		1	9	6	3	1	6	2	1	6	4	2	41
Total		125	77	165	91	87	38	154	25	62	23	86	93

Table 7

Proportionate Data Base Usage by Searcher[1]

Library	Employee Code Number	Percent of Searches Conducted by Searcher, by Data Base: ERIC	CHEM. ABS.	NTIS	SSCI	EI	CAIN	PA	INSPEC-P	ABI	PATS C/EMA	Other	Total Number of Uses	Percent of Total Uses, all Search
San Mateo County	3			23.3	10.0			50.0		13.3		3.3	30	3.2
	5	15.7	11.8	17.6	2.0	17.6	2.0	11.8	2.0	2.0		17.6	51	5.5
	8	20.6	8.8	23.5		20.6	2.9	23.5					34	3.6
	10	6.4	8.5	21.3	2.1	8.5	8.5	21.3	4.3	12.8		6.4	47	5.0
Redwood City	23	12.5	6.6	23.7	9.2	7.9	3.9	17.8	5.3	5.9	2.6	4.6	152	16.3
	24	25.0	3.8	9.6	13.5	1.9	3.8	30.8		3.8	1.9	5.8	52	5.6
	25	12.9	8.6	15.7	11.4	5.7	5.7	10.0	4.3	12.9	1.4	11.4	70	7.5
	26	4.8	23.8	19.0	11.9	16.7		11.9	2.4		2.4	7.1	42	4.5
Santa Clara County	35	19.8	2.3	16.3	15.1	10.5		16.3	3.5	3.5	2.3	10.5	86	9.2
	36	23.3	4.1	13.7	13.7	6.8	4.1	20.5	2.7	1.4	2.7	5.5	73	7.8
	37	3.8	12.5	25.0	5.0	18.8	2.5	5.0	2.5	8.8	5.0	11.3	80	8.6
San Jose	50	13.0	8.0	11.0	16.0	9.0	3.0	19.0	1.0	7.0	1.0	12.0	100	10.7
	52	6.7	10.0	23.3	6.7	6.7	13.3	6.7	3.3			16.7	30	3.2
	53	21.3	2.1	6.4	8.5	4.3	4.3	8.5		14.9	6.4	23.4	47	5.0
All Others		2.4	22.0	14.6	7.3	2.4	14.6	4.9	2.4	14.6	9.8	4.9	41	4.4
Total		125	77	165	91	87	38	154	25	62	23	86	933	
Percent of Total[1]		13.4	8.3	17.7	9.8	9.3	4.1	16.5	2.7	6.6	2.5	9.2		100.0

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[1] Figures differ slightly from Table 5 due to rounding differences.

Table 8

Data Base Connect Time by Searcher
(In minutes)

Library	Employee Code Number	Mean Connect Time for Data Base										Mean search time, per base all bases
		ERIC	CHEM. ABS.	NTIS	SSCI	EI	CAIN	PA	INSPEC-P	ABI	PATS C/EMA	
San Mateo	3			8.88	6.21			8.46		11.13		8.70
	5	7.96	8.12	6.77	2.81	9.15	12.19	10.90	1.19	1.63		5.52
	8	4.23	7.67	3.08		2.54	4.57	4.82				4.06
	10	6.54	2.64	5.38	2.08	4.91	5.04	15.68	2.48	4.74		7.35
Redwood City	23	6.85	6.42	6.67	3.43	9.85	6.67	6.56	6.22	2.13	3.13	6.20
	24	11.66	6.79	7.86	7.27	3.34	9.20	13.29		1.19	10.20	10.29
	25	11.33	6.00	8.41	6.50	6.38	2.75	7.74	15.00	5.56	8.00	7.50
	26	26.00	16.50	10.25	8.00	14.07		7.80	27.00		14.00	13.27
Santa Clara	35	19.52	4.13	12.69	10.61	6.41		13.90	6.39	10.77	4.90	12.55
	36	21.92	14.24	18.74	10.18	11.90	12.33	15.08	16.66	14.73	6.83	16.09
	37	11.31	15.72	12.67	10.24	9.43	16.67	21.28	2.93	5.77	1.77	11.25
San Jose	50	9.23	10.98	6.33	6.26	7.67	14.49	14.49	8.95	9.06	3.21	6.43
	52	11.09	15.86	9.05	9.47	16.17	4.86	9.16	12.81			9.40
	53	33.93	12.75	17.80	19.59	4.10	10.17	19.67		10.05	25.70	20.53

Table 9

Frequency Distribution of Off-Line Prints by Searcher

Interval	Number of Off-Line Prints														Total
	San Mateo County				Redwood City				Santa Clara County			San Jose			
	Searcher No.				Searcher No.				Searcher No.			Searcher No.			
	3	5	8	10	23	24	25	26	35	36	37	50	52	53	
0	77	101	79	77	245	84	116	75	153	150	105	120	70	123	1575
1-19	10	15	5	13	31	15	13	18	11		21	22	1		175
20-39	5	9	7	10	18	5	5	10	10	2	14	12		2	109
40-59	3	3	5	6	7	6	2	2	12	5	2	11			64
60-79				2	10	1	5		4	3	3	3		4	35
80-99					5		5	1	3	4		6			24
100-119					2	2	4		2		1	3			14
120-139					2	2	1	1	4	1	1	2			14
140-159					1				1			1	2	1	6
160 & above					11		4		6	3	3		2	2	31
Total	95	128	96	108	332	115	155	107	206	168	150	180	75	132	2047
Mean Number of Off-Line Prints: All Entries	13.79	10.73	14.07	19.04	38.67	22.83	39.38	16.94	40.39	22.71	21.81	26.28	32.37	18.31	
Mean Number of Off-Line Prints Non-Zero Entries	20.40	13.48	17.73	18.56	37.81	29.63	38.21	20.61	44.13	39.46	21.17	26.00	51.57	42.44	

Whatever its effect on the quality of the search, San Mateo's practice of limited off-line prints had a marked effect on searches completed at that library. San Mateo County printed an average of 29 citations per search off-line, whereas San Jose printed 66, Santa Clara County 71, and Redwood City 75.

Table 9 breaks down into intervals the number of citations printed out off-line per data base (more than one base could be used on each search) by searcher and indicates the mean number of prints per base both for the searches for which prints were made (the non-zero entries), and for all searches, including those for which no prints were made. The figures differ strikingly.

The intervals show an expected decrease in the number of occurrences, moving from smaller numbers of printouts to larger. No off-line prints were requested from more than half of the data bases; this could be because the search results were not satisfactory, or because the relevant citations were printed on-line. No searcher made a practice of printing monumental bibliographies. The mean values are more informative, showing some fairly significant differences among searchers.

The mean number of off-line prints for all cases (including those searches for which no prints were made) was 14.26 for San Mateo County's searchers taken all together, ranging individually from 10.73 to 19.04 (Table 9). Redwood City's overall average was 32.98; its librarians ran from 16.94 to 39.38. Santa Clara's overall figure was 29.40, the individual figures from 21.81 to 40.39. San Jose's library-wide mean was 23.92, its individual low 18.31 and its high 32.37.

Generally, it can be said that searchers varied widely when deciding how many citations were necessary and/or acceptable to the user. The intra-library similarities are marked only for San Mateo County. Otherwise it was the individual and not the library who was the determining factor in the number of print-outs.

TIME PER TASK

Another major source of difference was the staff time devoted to each task. From the descriptions of the various libraries' request procedures, it is evident that some placed more emphasis on certain tasks than did others. Tables 10 and 11 quantify this difference in two ways. Table 10 is the mean time per task, by library, for all non-zero entries only; i.e. once it is decided that a task is to be performed, that is the average time for that task. Table 11 averages into Table 10's figures the entries with values of zero, i.e. those searches for which that task was not performed. In many cases zero entries are a significant proportion of the observations.

Table 10

Mean Time Per Task By Library
(in minutes)

Task	Mean Task Time By Library								Overall Mean time	
	Redwood City		Santa Clara County		San Mateo County		San Jose			
	Mean	# of observation	Mean	# of observation	Mean	# of observation	Mean	# of observation	Mean	# of observation
Reference interview	9.65	91	12.92	89	9.97	59	8.57	56	10.50	295
Originating library preparation	21.00	1	8.33	2	19.58	42	5.00	1	18.65	47
Dialog library preparation	12.07	45	11.44	45	9.72	76	9.47	57	10.48	223
Search	19.63	138	30.42	103	14.09	91	28.31	76	22.72	408
Dialog library follow-up	9.34	66	12.64	91	16.31	83	9.40	67	12.21	307
Originating library follow-up	18.00	2	15.00	2	10.60	38	-	-	11.48	42
Follow-up with patron	7.58	31	8.03	66	7.79	43	6.52	31	7.61	171

Table 11

Mean Time Per Task by Library, All Entries
(in minutes)

Task	Mean Task Time by Library				Overall Mean Time n = 411
	Redwood City n = 138	Santa Clara County n = 103	San Mateo County n = 93	San Jose n = 77	
Reference interview	6.36	11.61	6.33	6.23	7.54
Originating library preparation			8.84		
Dialog library preparation	3.94	5.00	7.94	7.01	5.69
Search	19.63	30.42	13.79	27.94	22.55
Dialog library follow-up	4.47	11.17	14.56	8.18	9.12
Originating library follow-up			4.33		
Follow-up with patron	1.70	5.15	3.60	2.62	3.17
Total	36.10	63.35	59.39	51.98	48.07

Table 10 shows differences among libraries, but none vary much from the group mean. The single exception is search time, which varies from a low of 14.09 minutes for San Mateo County to a high of 30.42 minutes for Santa Clara County, with an overall mean of 22.72 minutes. (More about this later.) However, Table 11 brings out more differences. For instance, reference interviews were around 6.3 minutes for all libraries except Santa Clara County, where the average was 11.61. The numbers of observations in the two tables explain the difference; 86% of Santa Clara County's requests were accompanied by a reference interview, while the next highest percentage was San Jose at 73%. Similarly, DIALOG library follow-up time as measured in Table 11 varies from a low of 4.47 minutes (Redwood City) to a high of 14.56 minutes (San Mateo County). Only 48% of Redwood City's requests had the DIALOG library follow-up performed, while 89% of San Mateo County's did.

The conclusion therefore is that the determining factor in time per task was whether or not the task was performed. Once the decision was made to perform the task, the time required was similar among libraries. The search time was the one important exception. This time is especially important since it determined not only salary expenditures, as did the other tasks, but also the charge for connect time, which, as will be seen, was a significant part of the overall cost.

In order to statistically determine if there were differences in the times taken to perform each of the seven tasks across the four libraries, a set of Analyses of Variances was conducted. These variances are reported in Table 12. The table shows that there were significant differences in the times taken to perform the reference interview, search, and DIALOG library follow-up.

While the Analysis of Variance indicated some differences in group means, by itself it did not indicate which of the four library's task times was significantly different from any other. To determine this, systematic comparisons of all possible combinations of task time mean values were performed and the results evaluated using Scheffe's test (1). Table 12 shows that for the Reference Interview there was a significant difference between Santa Clara's (SC) time and the times of Redwood City (RC), San Mateo (SM), and San Jose (SJ), but that there was no difference between the latter three means. Similarly for search time, Redwood City and San Mateo were significantly different from Santa Clara and San Jose.

PATRON'S PRESENCE

One decision that the participating libraries had to make was whether the requestor should be present during the search. On the one hand, the requestor was often much more familiar with the subject than the librarian was and could provide both an instant evaluation of how well the search was going and perhaps suggest alternative search strategies. The process of the search might also help draw out a non-communicative patron, and help him/her understand what the librarian needed to know.

(1)See (Kirk, 1968) for a discussion of this procedure. The test was conducted at the 0.05 level of significance.

Table 12

Analysis of Variance for Task Times

Variable Name	Source of Variance	Degrees of Freedom	Mean Squares	F Ratio	F Probability	Scheffe's Test
Reference Interview Time	Between Groups Within Groups	3 291	270.97 26.46	10.24	.000	(RC,SM,SJ) vs (SC)
Originating Library Preparation Time	Between Groups Within Groups	3 45	184.66 897.27	0.21	.892	
Dialog Library Preparation Time	Between Groups Within Groups	3 219	85.45 73.84	1.16	.327	
Total Search Time at Terminal	Between Groups Within Groups	3 406	5528.85 258.71	21.37	.000	(RC,SM) vs (SC,SJ)
Dialog Library Follow-Up Time	Between Groups Within Groups	3 304	830.86 41.96	19.80	.000	(RC,SJ) vs (SC) vs (SM)
Originating Library Follow-Up Time	Between Groups Within Groups	2 41	111.95 83.20	1.356	.272	
Follow-Up Time With Patron	Between Groups Within Groups	3 167	16.73 15.71	1.064	.366	
Total Time for Search	Between Groups Within Groups	3 407	14142.62 710.70	19.90	.000	(RC) vs (SC,SM,SJ)

On the other hand, a user unfamiliar with the search process could slow the search down, requiring lengthy explanations during the terminal sessions. The librarian might also prefer not to have someone watching over his/her shoulder during the search.

Ultimately, only Santa Clara County made a regular practice of allowing the patron to be present during the search. Thus figures are available on the relative lengths of searches with and without the patron, but only for Santa Clara County.

Of the 103 Santa Clara County searches reported, 60 were performed without the patron, and 43 with the patron. The average search time for those with no patron present was 25.0 minutes versus 37.9 for those with patron present. The chance of this large a difference resulting simply from random fluctuations is less than 1%; searches with the patron take significantly longer. However, the total time required for all tasks did not vary that much; without patron, the average was 56.3 minutes, with patron it was 61.0 minutes. There is a 7.5% chance that the sample means are not significantly different. Thus it is not conclusive that the patron's presence at the search has an adverse effect on total search time. It may be that the patron's presence at the terminal shortens the time required for either the reference interview or for the follow-up with the patron.

COSTS

All of these time figures can now be translated into costs, using the salary and fee schedules (Tables 2 and 4). Rather than calculate costs based on the average time figures arrived at earlier, the procedure in this study was to calculate directly the actual costs for each search based on the time required, the salary of the person performing the task, and the data base(s) used.

The mean salary costs for each task, by library, are presented in Table 13. The figures for the individual libraries cluster reasonably around the means for the group as a whole. The one exception is originating library figures, for which only San Mateo County had enough observations to be meaningful. The costs were quite low, averaging $1.03 for the reference interview, $1.95 for originating library preparation, $1.02 for DIALOG library preparation, $1.16 for follow-up at the DIALOG library, $1.07 for originating library follow-up, and finally $.74 for the post-search time spent with the user.

Table 14 presents another analysis of the costs incurred in the on-line search itself. The overall average was $17.29 for computer time, $9.16 for off-line printouts. and $2.24 for the labor at the terminal. This, combined with $5.02 for all other labor (detailed in Table 9), brings the cost for the entire search process, for all libraries, to an average of $28.41.

Table 13

Mean Salary Cost Per Task By Library
(in dollars)

Task	Mean Task Cost By Library				
	Redwood City	Santa Clara County	San Mateo County	San Jose	Overall
	Mean	Mean	Mean	Mean	Mean
Reference interview	$1.04	$1.21	$1.02	$ .80	$1.03
Orginating library preparation	1.14	.76	2.10	.45	1.95
Dialog library preparation	1.21	1.06	.97	.87	1.02
Search	2.03	2.83	1.47	2.70	2.24
Dialog library follow-up	.87	1.17	1.61	.87	1.16
Orginating library follow-up	.53	1.39	1.08	-	1.07
Follow-up with patron	.79	.75	.81	.60	.74

Table 14

Search Costs
(in dollars)

Cost Element	Mean Task Cost By Library				Overall Mean Cost
	Redwood City	Santa Clara County	San Mateo County	San Jose	
Data Base Charges	$14.51	$22.16	$10.55	$23.69	$17.29
Off-Line Print Charges	9.73	12.60	3.64	12.96	9.16
Search Labor Cost	2.03	2.83	1.47	2.70	2.24
Labor Cost for All Other Tasks	3.64	5.91	6.22	4.93	5.02
Total Cost of Search[1]	25.33	35.17	19.74	35.19	28.41

[1] The total cost is not additive due to differences in the number of observations for each cost element.

The individual libraries differed significantly from this mean, ranging from a low of $19.74 (San Mateo County) to a high of $35.19 (San Jose) and $35.17 (Santa Clara County). Redwood City was a little below the average at $25.33. No one item accounts for the differences.

San Mateo County, with the lowest overall average, had the highest labor cost for activity other than time at the terminal. They more than make up for this, however, by spending less on terminal time, both for computer time and labor, and also by printing far fewer citations. Referring back to the mean time per task in Table 10, it is evident that San Mateo County's searchers spent significantly less time at the terminal per search. The higher costs for other labor probably came from the added step incurred when requests originate at a library other than the one at which the terminal is located.

Santa Clara County and San Jose differed by only a few cents in the total search cost but their breakdowns were not identical. San Jose spent more on data base charges, though a little less on salaries for the other tasks. This indicates the use of more expensive bases and/or less expensive personnel (note that their most prolific searcher was the unpaid volunteer whose time was evaluated at the Librarian I rate). As indicated in Table 10, San Jose generally spent a little less time on each task than did Santa Clara County.

To look a little closer at the search process, Table 15 presents search costs for the high-frequency searchers. At this level there is more across-library variation. The three searchers who spent the least salary at the terminal belong to the low-ranking San Mateo County (searchers 8, 3, and 10). The next three lowest are from other libraries, two from Redwood City (23 and 25) and one from San Jose (52). One of Redwood City's searchers (23) is a relatively expensive Librarian III. The highest salary costs were incurred by Librarian I's from both San Jose (number 53) and Redwood City (26).

The data base charges, which are the largest single element in the search cost, follow a similar pattern. The six lowest searchers in terms of salary also account for five of the six lowest searchers in data base charges. The off-line print charges, as indicated earlier, differ strikingly, bringing all four of San Mateo County's searchers down to the four lowest total search costs. San Mateo County searchers are followed by searcher 23 from Redwood City and 32 from San Jose. The highest total search cost was attributed to searcher 37 of Santa Clara County, followed by searcher 36 from Santa Clara County.

Generally, however, differences within a library were not as striking as those between libraries. Thus it appears that although individual searchers do vary, the overriding consideration is the library at which they are searching. This could be a result of library policy, either written or implied (evidence the San Mateo County effort to keep down the number of prints). It could also be a result of interaction among the searchers at a library, arriving among themselves at a definition of what is an acceptable search length and number of prints. Also, since most of the searchers received at least part of their training from others in their own libraries, it could be that the intramural similarities reflect a common teacher.

Table 15

Mean Search Cost for Selected Searchers

(in dollars)

Library	Searcher Code	Search Labor Cost	Data Base Charges	Off-Line Print Charges	Total Cost
San Mateo	3	1.45	10.76	2.72	21.56
	5	2.24	12.74	3.15	19.82
	8	0.94	6.02	4.11	15.35
	10	1.48	12.17	4.25	21.59
Redwood City	23	1.81	11.80	12.29	23.86
	24	2.84	20.90	7.06	32.45
	25	1.61	13.02	12.34	24.86
	26	3.43	24.69	5.27	33.37
Santa Clara	35	2.56	19.19	13.04	33.40
	36	3.19	23.70	13.10	34.97
	37	2.80	24.70	10.97	37.57
San Jose	50	2.48	22.07	9.67	34.89
	52	1.89	15.03	32.95	24.35
	53	3.96	34.98	15.86	27.13

Two factors determine the computer charges for connect time: the time required for the search and the choice of data base. It is possible to separate out those two effects by considering the ratio of the cost of data base connect time to search time. This has the effect of normalizing the connect charge to reflect varying lengths of time spent searching. The actual ratios were:

Redwood City	$ .74/min.
Santa Clara Co.	$ .73/min.
San Mateo Co.	$ .77/min.
San Jose	$ .85/min.

From this it can be concluded that all libraries were spending roughly the same amount per connect minute for computer time. San Jose was slightly higher, denoting a slight tendency to make greater use of the more expensive bases.

Similarly, the salary cost for any part of the search depended both on the time spent and the salary of the person performing the task(s). Considering again the on-line search, the ratios of labor cost to time at the terminal for the libraries were:

Redwood City	$ .10/min.
Santa Clara Co.	$ .09/min.
San Mateo Co.	$ .11/min.
San Jose	$ .10/min.

The libraries did not vary greatly in the overall salary cost per minute at the terminal.

Broadening this analysis to the entire DIALOG process, the ratios of the total cost of the DIALOG process (labor, computer charges, printouts) to the total time, from reference interview through follow-up were:

Redwood City	$ .71/min.
Santa Clara Co.	$ .55/min.
San Mateo Co.	$ .33/min.
San Jose	$ .68/min.

A likely explanation for the low San Mateo County figure is that their searches tended to be more labor-intensive, while the others were more computer-intensive and computer time is much more expensive than people-time. Redwood City's searches also tended to use less computer time. However, their off-line printout charge was much higher than San Mateo County's and their chief searcher during the data collection was a relatively expensive Librarian III (the other libraries relied mainly on Librarian I's)(1).

(1) San Jose Public Library has recently indicated that with the advent of user charges for computer time, they are moving toward a more labor-intensive and less computer-intensive search pattern.

COMBINATIONS OF TASKS

In the description of the DIALOG process as it is performed in each library, it was pointed out that the libraries differed in the emphasis placed on different tasks. For instance, San Jose made no special effort to perform either a reference interview or to spend post-search time with the patron. Santa Clara County, on the other hand, tried to have the patron submit to a reference interview with a DIALOG staff member.

The greatest number of tasks that might possibly be performed would be for a search that originated in a library without a DIALOG terminal, for which all seven tasks listed on the time sheet could be performed. For a request originating at a DIALOG library, the maximum number of tasks would be five, eliminating the two tasks that are specific to non-DIALOG libraries.

Table 16 shows the twelve (out of 128 possible) combinations of tasks that were most frequently performed. These twelve accounted for 338 of the searches performed, or 82%. The most used single pattern of tasks was number ten in Table 16. This pattern consisted of a reference interview, DIALOG preparation, search, DIALOG follow-up, and a follow-up with user; the "complete" DIALOG-originating pattern. The next most common was pattern seven, the same as ten but with the DIALOG preparation omitted. Pattern twelve, every possible task performed, occurred only ten times.

Given that different patterns of tasks mean that more or fewer steps are performed for each search, it follows that different patterns result in different costs.

Table 17 shows the mean total search cost, by library, for each of the frequently occurring combinations of tasks. Surprisingly, the lowest overall mean is the one with the most tasks (combination number 12). This figure is not conclusive, however, due to both the low number of cases (ten) and the fact that all cases were from San Mateo County, which had consistently low search costs.

The second least costly (again with figures only from one library, in this case Redwood City) was the sixth instance, which consisted of a reference interview, the search, and follow-up with patron.

Interestingly, the bare bones search - no task performed other than the actual on-line search - although inexpensive, at $15.67 (number one), was only the third least expensive combination.

The most expeive combination, considering all libraries together, was combination number eight, reference interview, search, DIALOG library follow-up and follow-up with user at $38.08. The next most expensive was pattern number ten, which includes all the tasks in combination eight plus DIALOG library preparation. The additional task lowered the cost to $34.23.

Table 16
Most Frequent Combinations of Tasks Performed for DIALOG Searches

Combination Number	Combination of Tasks							Frequency of occurrence
	Reference Interview	Originating Library Preparation	Dialog Library Preparation	Search	Dialog Library follow-up	Originating Library follow-up	Follow-up with User	
1	0	0	0	1	0	0	0	21
2	0	0	0	1	1	0	0	22
3	0	0	1	1	1	0	0	21
4	0	0	1	1	1	0	1	11
5	1	0	0	1	0	0	0	35
6	1	0	0	1	0	0	1	10
7	1	0	0	1	1	0	0	44
8	1	0	0	1	1	0	1	41
9	1	0	1	1	1	0	0	40
10	1	0	1	1	1	0	1	70
11	1	1	1	1	1	1	0	13
12	1	1	1	1	1	1	1	10
Total								338

Note: 0 indicates task not performed; 1 indicates task was performed.

Table 17

Total DIALOG Search Cost for Frequently Occuring Combinations of Tasks (in dollars)

Combination Number	Mean Total Search Cost				
	Redwood City	Santa Clara	San Mateo	San Jose	All Libraries
1	16,85	22.01	15.62	12.00	15.67
2	23.42	76.30	10.20	31.56	25.50
3	35.30	33.86	18.92		25.97
4	35.30	33.86	18.92		25.97
5	23.11	9.62		47.85	23.43
6	9.75				9.75
7	25.96	28.30		35.26	28.13
8	26.82	43.93	16.33	28.56	38.08
9	29.59	28.40	16.07	38.71	31.09
10	33.40	39.62	19.62	36.90	34.23
11			26.07		26.07
12			1.61		1.61

These data on task combinations imply that there is no direct correlation between the number of tasks performed and the cost of the search. San Mateo County had the lowest average cost, while generally performing more tasks per search than other libraries did.

ELAPSED TIME

Two measures of time are important to the user of any kind of search service. One is the time that the user or his/her surrogate actually spends on the search. The use of on-line searching reduces this measure from hours, even days, which must be spent leafing through abstracting and indexing publications, to only minutes spent conferring with the search personnel.

The second measure is waiting time - how long the user must wait from the instigation of the request until the results are received. The waiting time is an indication of how quickly the search service processes the request.

The mean time that requests spent in the system, (1) from the first patron contact until the last task (whatever that was) for all of the libraries together was 7.79 days (calender, not working days). For the individual libraries the figures were: Redwood City, 6.02 days; Santa Clara County, 4.87 days; San Mateo County, 14.67 days; and San Jose, 6.79 days. (2)

Table 18 analyzes this data further. This table shows the mean time between various pairs of tasks, by library. Not every task was performed for each search; the figures are only for those cases in which both elements of the pair in question were performed. It is also worth noting that the pairs examined were not necessarily successive tasks, but those for which a significant number of observations were available. There is overlap among the pairs examined, e.g. reference interview to search subsumes reference interview to originating library preparation, reference interview to DIALOG library preparation, and DIALOG library preparation to search.

Redwood City's data show a regular progression through the tasks. Reference interview to search required about two days of the six overall; search to follow-up with patron tended around three days. Considering that off-line printouts were sent first class mail, and required a minimum of two days to arrive, the figures were quite good.

(1)The minimum time possible is one day and that is for same day service.

(2)All of the libraries would expedite rush requests, if the patron had a good reason.

Table 18

Days Elapsed Between Tasks

Task Interval	Library								MEAN
	Redwood City		Santa Clara		San Mateo		San Jose		
	Mean	# of observation	Mean	# of observation	Mean	# of observation	Mean	# of observation	
Reference Interview to Originating Library Preparation					1.74	14			1.74
Reference Interview to Dialog Library Preparation	1.91	24	2.23	38	4.63	52	5.46	47	3.90
Originating Library Preparation to Dialog Library Preparation			4.50	2	4.94	37			4.9
Dialog Library Preparation to Search	.59	41	.88	45	3.77	76	0.75	58	1.79
Reference Interview to Search	1.93	92	3.05	89	8.77	58	6.12	56	4.9
Search to Dialog Library Follow-Up	1.60	66	0.16	92	1.85	83	1.08	67	1.19
Search to Originating Library Follow-Up	2.00	2	2.50	2	7.31	38			6.83
Search to Follow-Up With Patron	3.03	30	2.66	66	7.72	43	3.03	31	4.00
Dialog Library Follow-Up to Originating Library Follow-Up					6.00	38			6.00
Originating Library Follow-Up to Follow-Up With Patron					0.93	15			0.93
Dialog Library Follow-Up to Follow-Up With Patron	1.70	20	3.70	60	7.34	41	2.26	30	4.14
Average time in system, all cases	6.02	140	4.87	103	14.67	91	6.79	77	7.79

Santa Clara County shaved about a day off Redwood City's time, primarily in the post-search time. The Santa Clara County off-line print figures showed a greater tendency on the part of searchers to request no off-line prints. This tendency might have been a result of having the patron present frequently (citations that might have been printed off-line in the patrons' absence might be printed on-line or not at all). This would eliminate the wait for the U.S. Postal Service and might account for Santa Clara County's lower post-search figure.

San Mateo County was the slowest of the group, at 14.67 days. Table 18 shows them with consistently higher figures than the other libraries, with the time divided almost equally between pre- and post-search (8.77 days vs. 7.72). San Mateo County was the only library with a significant number of tasks performed at the originating library, which added a step and a possible bottleneck to the search process. It may also be that the lack of direct contact with the patron made San Mateo County tend not to hurry in searching a request once it was received. Furthermore, DIALOG requests were competing with other subject requests received from the branches in much the same way as the DIALOG requests. In other words, DIALOG-requests simply had to wait their turn.

San Jose's total of 6.79 days was a distant second to San Mateo County. The bulk of that time (6.12 days) was pre-search, echoing San Mateo County's pattern of having the request sit waiting. In this case, however, the wait was for San Jose's part-time searcher. Also, the San Jose staff had complained early in the project of being squeezed between DIALOG and their regular duties. This long pre-search wait and short post-search time suggest a general backlog. Items were handled speedily, once their turn came, but there were others competing for the staff's attention.

CONCLUSIONS

This study has reported the costs of on-line bibliographic searching in four public libraries in the San Francisco Bay Area using the Lockheed DIALOG system. This study was conducted during a period when search time was provided to the libraries without charge and the searchers were moderately experienced. It was found that there were seven different tasks involved in the search process. In the course of the study 35 individuals from the four libraries reported their own processing times for 411 search requests.

Two limitations should be considered in evaluating the results of this study. One is the self reporting nature of the data. Participants recorded time spent on search tasks rather than being observed and measured by others. Consequently, a possible bias is introduced depending on the accuracy with which the searchers recorded their times. A second limitation is the experimental nature of the project. On-line searching of the DIALOG system was provided at no cost to the public libraries through a grant from the National Science Foundation. Thus the searchers were under little economic pressure to perform effectively.

Considerable variation in the time required to perform search tasks was found between libraries and between searchers. For example, the average connect time to a data base for an individual search was 22.72 minutes. But this varied from 19.63 minutes at the Redwood City Public Library to 30.42 minutes at Santa Clara to 28.31 minutes at the San Jose Public Library. Similar variations were found in the overall cost of a bibliographic search: Redwood City's average was $25.38, Santa Clara's was $35.17, San Mateo's was $19.74, San Jose's was $35.19, and the overall average for the 411 searches was $28.41. The most expensive portion of the overall cost was the actual on-line search time, which averaged $17.29 for all searches. The next most expensive element of the total cost was that of off-line prints--this averaged $9.16 for all searches.

The only element that was omitted from the cost calculations was telephone line charges. This was due to the fact that the four libraries were in close physical proximity to Lockheed's computer center. If this situation did not hold for other searching locations it would be necessary to add the telephone costs. Assume a $10 per hour telephone connect charge through an organization such as TYMSHARE, and a mean search time of 22.72 minutes. This results in an average telephone charge of $3.79 which, when added to the $28.41 search total, totals $32.20 for the average search.

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Appendix A

DIALOG Time Sheet

DIALOG TIME SHEET

Please enter time in minutes to the nearest five minutes. Please date and initial each entry.

DIALOG LIBRARY: 1. RCPL____ 2. SCCO____ 3. SMCO____ 4.________

Patron name (optional):____

Request number:________________

Originating Library____

EVENT	TIME IN MINUTES	DATE	INITIALS
REFERENCE INTERVIEW initial patron contact			
ORIGINATING LIBRARY PREPARATION TIME without patron			
DIALOG LIBRARY PREPARATION TIME without patron			
DIALOG CONNECT TIME	don't enter time	(do date and initial)	
DIALOG LIBRARY FOLLOW-UP TIME without patron			
ORIGINATING LIBRARY FOLLOW-UP TIME without patron			
FOLLOW-UP TIME with patron			
MISCELLANEOUS describe:			

DIALOG CONNECT TIME Patron present? Check if yes____

DATA BASE	ELAPSED TIME	NO. OF OFF-LINE PRINTS

Use reverse to list additional bases searched on the same request as above.

Appendix B

Alternative Cost Calculations

In Tables 13 and 14 of the text the mean salary costs and mean search costs were summarized. These tables were calculated on the basis that each occurrence of a task resulted in a cost of performing the task and that the total cost was the sum of the task costs for all tasks which were performed.

Tables B-1 and B-2 are the analogies to Tables 13 and 14 with a different method of computation used. In Tables B-1 and B-2 the mean unit cost of a task is determined by dividing the total cost by the total number of valid observations, not just the number of observations for which the time was non-zero. While the mean search costs (Table B-2) remain relatively stable, there is a considerable reduction in the salary costs per task (Table B-1).

Table B-1

Mean Salary Cost Per Task by Library, All Entries

(in dollars)

Task	Mean Task Time by Library				
	Redwood City	Santa Clara County	San Mateo County	San Jose	Overall
	Mean	Mean	Mean	Mean	Mean
Reference interview	.68	1.05	.65	.58	.75
Originating library preparation			.95		.22
Dialog library preparation	.39	.46	.81	.64	.55
Search	2.03	2.83	1.47	2.70	2.24
Dialog library follow-up	.42	1.04	1.44	.75	.87
Originating library follow-up			.44		.11
Follow-up with patron	.18	.48	.37	.24	.34

Table B-2

Mean Search Costs, All Cases
(in dollars)

Cost Element	Mean Task Cost by Library				Overall Mean Cost
	Redwood City	Santa Clara County	San Mateo County	San Jose	
Data base charges	14.51	22.16	10.55	23.69	17.29
Off-Line Print charges	7.48	7.09	2.90	6.56	6.17
Search Labor Cost	2.03	2.83	1.47	2.70	2.24
Labor Cost for All Other Tasks	1.67	3.03	4.66	2.21	2.81
Total Cost of Search	25.69	35.11	19.58	35.16	28.51